

PACIFIC

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PACIFIC

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REFERENCE MANUAL

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Development of Naval Aviation (1910 - 1942)

Before the Second World War, few could imagine a naval war that did not place the battleship on center stage. By the end of the war, however, the aircraft carrier had stolen the spotlight. On the offense, carrier-based aircraft could strike virtually anywhere, without regard to the location of friendly airfields. Furthermore, the amphibious invasions by which the U.S. took back the Pacific Ocean would have been impossible without the air cover carriers provided for the invading fleets.

American experiments with aircraft carriers date back to 1910, when the U.S. Navy first landed planes on platforms on modified battle cruisers. While it proved practical to launch planes from conventional warships, it was hardly possible to *land* the planes back on those same ships.

Another method of applying airpower at sea was attempted during World War I — namely, the seaplane carrier. Such a ship could “launch” its fighters by winching them over the side, allowing the seaplane to take off from the surface of the ocean. However, this technique only worked in calm seas.

Naval visionaries began to ponder the idea of using “floating runways” to launch aircraft in the early '20s. In 1923, the British completed their first aircraft carrier, the *Hermes*. The Japanese carefully followed these developments and soon hired British consultants to help them design the *Hosho*. These ships differed from conventional warships by having flat decks with minimal superstructures, allowing them to both launch and recover aircraft.

The most outspoken proponent of naval aviation was William “Billy” Mitchell, a World War I Army pilot who carefully observed and evaluated military tactics. It was Mitchell who organized the demonstration in which American aircraft successfully sank a captured German battleship. He published extensively, trying to win Americans over to the merits of naval aviation. Even though his claims were often overstated, he succeeded in focusing the military's attention on the possibility of naval aviation.

The advantages of using aircraft carriers as a means of applying airpower in distant places surfaced during naval wargames, when the aircraft carrier *Saratoga* launched 70 planes in a mock attack on the Panama Canal. At last, senior admirals began to admit that there might be a role for naval aviation in the future.

Meanwhile, an international treaty to limit the arms race gave new life to the proponents of airpower. Politicians, in an effort to limit the proliferation of battleships, agreed to place a limit on the number of such ships each nation could have. Those countries that had new battleships under construction were allowed to modify them into aircraft carriers instead — a class of ship that was then seen as less dangerous to the world balance.

The result was an international race to construct aircraft carriers. The first attempts by the U.S. resulted in two hefty carriers, the *Lexington* and the *Saratoga*. The

Americans also constructed a smaller carrier, the *Ranger*. By 1938, the U.S. Navy had added the *Yorktown* and *Enterprise* to their carrier fleet, along with the *Wasp* and *Hornet*.

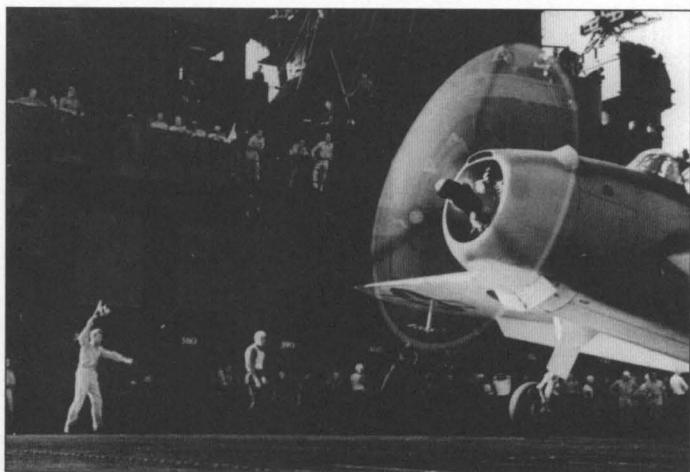
Keeping pace, the Japan built the *Soryu*, *Hiryu*, *Shokaku* and *Zuikaku*. By December 1941, the Imperial Navy had brought nine carriers into service, while the Americans had completed eight ships.

This flurry of construction, however, did not mean that the admirals understood the potential of the ships they were building. At best, aircraft carriers were envisioned as support vessels in future naval warfare — performing scouting functions, escorting other warships, or making “nuisance” raids on enemy fleets. In the minds of the traditionalist admirals, the next war would still be decided by the mighty clash of battleships somewhere in the central Pacific.

It took an act of war to change mens’ minds. With a single carrier-launched air raid, the Japanese obliterated the battleships of the U.S. Pacific Fleet. The raid on Pearl Harbor finally emphasized just how effective carrier-based airplanes could be. Fortunately, none of the American aircraft carriers were in Pearl Harbor that fateful morning when the battleships suffered crippling losses.

A few days later, Japan’s land-based bombers attacked the British battleships *Prince of Wales* and *Repulse* off the shores of Malaya. The bombers managed to sink both ships with minimal losses to their own forces, proving that the success at Pearl Harbor was not a fluke. Only months would pass before the world would see the first naval battle dominated by airpower.

The Battle of the Coral Sea was the first battle fought entirely by aircraft. Although only miles apart, the Japanese carriers *Shokaku* and *Zuikaku* never saw the American *Yorktown* and *Lexington*. Instead, the battle was fought by the planes launched from each fleet. This novel style of warfare — engagements between carrier-based aircraft — would dominate the Pacific conflict.



— ★ —
Deckhands
aboard an
unidentified
U.S. carrier
watch intently
as a signaling
officer waves a
TBM Avenger
down the
flight deck.
(1944)

— ★ —

Japanese Expansion (1936 - 1941)

The events leading up to the Pacific conflict resulted from the extraordinary power the military exerted in Japan. Supported by a number of political groups and social clubs, the military claimed a special relationship with the Emperor and greatly influenced the Japanese government. By withdrawing its ministers from the cabinet, the military could dissolve the Parliament at any time.

Military leaders ultimately wanted control of the state in order to rid the government of corruption and moral decay. In their opinion, only expansion into resource-rich territories would cure Japan of its economic and social ills. By seizing power, the militarists felt that they could bypass corrupt politics and use war to guide Japan out of its misery.

However, the Army and Navy considered each other rivals, and refused to cooperate. Furthermore, both groups were riddled with internal controversy. Some officers wanted to prepare for a modern war through mechanization and sophisticated technology. Others disagreed because they thought it came at the expense of the spirituality and aggressive fighting spirit of the traditional Japanese military.

Increasingly, middle-level officers simply took matters into their own hands. In September 1931, Army forces attacked Manchuria without the knowledge or consent of the Japanese government. Within a few months, they had set up a Japanese colony on the mainland — the puppet state of Manchukuo.

Over the coming years, as Japan suffered devastating earthquakes, a plummeting stock market, and onerous foreign tariffs, politicians continued to lose power to the military. The generals thought they knew exactly what to do to strengthen the Japanese nation. In 1936, they launched a war of conquest against China.

Technologically, Japan commanded one of the most advanced military forces in the world. The generals hoped for a quick initial victory over the weak Chinese army with its obsolete weaponry, but the vast expanse of China took its toll on Japanese troops. Instead of a lightning victory, the campaign continued to drag on despite an unbroken string of Japanese victories.

Japan's ruthless expansionist policies posed great concerns to the United States. Atrocities committed against Chinese civilians in Nanking and the sinking of an American gunboat on the Yangtze River caused the U.S. to increasingly distrust Japan. When the Imperial government refused to renew the arms limitations treaty and embarked on an ambitious naval construction program, Washington's worst fears were confirmed.

After the Japanese pressured the French into surrendering their Indo-China colony, the United States finally decided to take action. President Roosevelt deployed the U.S. Pacific Fleet to Hawaii for an indefinite period of time and announced an embargo on various war materials, including fuel. To the Japanese, this meant they had to either back down or suffer a crippling shortage of resources in their ongoing war in China. Or ... they could seize the rich oil fields in the Southwest Pacific.

When war broke out in Europe, the early ascendancy of Nazi Germany provided further opportunities for Japanese expansion in Southeast Asia. Among the colonial powers, France and the Netherlands had been conquered, and Britain was fighting for her life and in no condition to defend her colonies. Malaya, Borneo, Burma, Siam, Indochina and even Australia now lay defenseless. The only nation capable of halting Japanese expansion was the United States.

The Japanese military had always seen conflict with the United States as inevitable, and so they did not shrink from it now. However, they were well aware of their limitations — Japan, a resource-poor nation, daring to fight the United States, one of the richest of nations. As Admiral Yamamoto warned, Japan's only hope for victory lay in a quick war. If the conflict were prolonged more than six months, then America's industrial strength would mean eventual defeat for Japan.

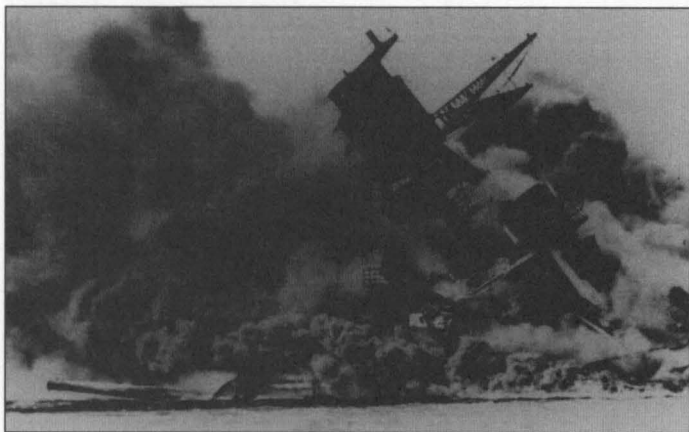
Consequently, the Japanese made plans to begin the war with a bold strike designed to cripple their enemy from the start — the raid on Pearl Harbor. If the U.S. Pacific Fleet could be knocked out, surely the Americans would be forced to sue for peace.

Pearl Harbor (December 1941)

When the first wave of Japanese airplanes roared over Oahu on December 7, 1941, the men stationed at Pearl Harbor were either asleep or waking to another relaxing Sunday. Nobody suspected that a terrible onslaught was imminent.

At 0755 Hawaiian time, the once-silent harbor rocked with explosions as Japanese bombers assaulted the Pacific fleet with bombs and torpedoes. Minutes later, Lieutenant Commander Mitsuo Fuchida excitedly sent the coded message "Tora! Tora!" to relay the success of the attack on the U.S. Pacific Fleet.

In retrospect, it is surprising that the U.S. forces at Pearl Harbor were so completely unprepared for the Japanese attack. Several factors indicated that the attack on the Hawaii base was feasible, if not likely. The fateful attack might have even been prevented if someone had listened to the warnings of war.



— ★ —
*The Battleship
USS Arizona
slowly rolls
over into its
grave after
bombs ignite
its forward
magazine.
(1941)*

— ★ —

Military strategists had pondered the possibility of a Japanese surprise attack on Pearl Harbor as early as 1936. Two military reports on Hawaii's strategic position indicated that a strike against the island could potentially cripple the U.S. Pacific forces. However, the U.S. expected the Japanese to go on the offensive elsewhere in the Pacific, perhaps in the Philippines. In spite of the considerable force gathered at Pearl Harbor, the U.S. Pacific Fleet was barely in condition to counter Japanese aggressions in the Pacific arena. Since high-ranking American officers thought the Japanese would deem the destruction of the American fleet unnecessary, most troops stationed in the Pacific were in training instead of on alert.

Even in the hours before the attack, vital signs of a hostile presence in the area had either been discounted or misinterpreted. In the early morning hours of December 7th, the destroyer *USS Ward* was patrolling near Pearl Harbor when it spotted and sank a Japanese submarine. The officer on duty at the Harbor Control Post reported the matter to Admiral Husband E. Kimmel. Unfortunately, Kimmel decided to wait on confirmation from the *Ward* and no further action was taken.

Later that morning, around 0700 hours, a radar warning station on the north shores of Oahu detected a swarm of planes. When the radar operator relayed this news to the Aircraft Warning Center, the officer on duty told him to forget the matter; the detected planes were thought to be a squadron of B-17s from the mainland.

Fuchida and his men homed in on the signal from Oahu's radio station and headed for Pearl Harbor under ideal conditions. The weather was clear, allowing perfect visibility for the bombing attacks. The airplanes at Bellows, Hickam and Wheeler airfields were parked wingtip-to-wingtip on the tarmacs. In the calm harbor, the majority of the U.S. battleships, cruisers and destroyers were peacefully anchored side by side. The only fleet members missing were the aircraft carriers, all of which were at sea that morning.

Japanese *Val* and *Kate* bombers led the raid, dropping a hail of explosives on ground installations all around Pearl Harbor. Explosions catapulted debris along the

— ★ —
Spectacular
explosions
during the
December 7
strike against
Pearl Harbor
stun the men
on Ford Island
Naval Station.
(1941)

— ★ —



shore as men bolted from their barracks and raced toward planes and anti-aircraft guns. Shortly after, Japanese planes unleashed torpedoes specifically designed to perform in the harbor's shallow water. Level bombers completed the destruction, targeting ships that had escaped the lethal torpedoes.

Direct hits damaged the *West Virginia*, *California* and *Nevada*. On the *Arizona*, a bomb ignited the forward magazine. The resulting explosion even rocked the attackers' planes in the air, as Commander Fuchida recalls. It also claimed the lives of most of the *Arizona*'s 1,500 crew members. When the *Oklahoma* was hit by several torpedoes, she capsized and entombed 400 crew members with her. Meanwhile, Japanese *Zero* fighters were roaming the area and strafing the airfields, destroying over 170 planes and severely damaging 130 others.

American ground crews were completely unprepared for the attack. In fact, some anti-aircraft gunners had not yet been issued live ammunition. However, they managed to scramble to their posts within five minutes of the attack and reply with anti-aircraft fire. Pilots able to reach their aircraft dashed into position to meet the next wave of Japanese bombers. One pilot leapt out of his church pew and commandeered a ride to his base — he took off wearing his Sunday suit.

After the first wave of Japanese fighters departed around 0830 hours, a brief lull in the fighting allowed the Americans to fortify their defenses. As a consequence, the second group of Japanese attackers had a more arduous task. Not only were they forced to dodge a steady barrage of anti-aircraft fire, but smoke from the previous explosions partially obscured their targets. However, the few American planes that managed to get off the ground never posed any serious threat and were quickly eliminated. The Japanese lost around 20 fighters in the second attack, double the losses they had suffered during the first hour. Their bombs completely destroyed the *Cassin* and *Downes* and severely damaged the *Pennsylvania*, which was being repaired in the dry dock.

When the final wave of Japanese planes departed three hours after the first bomb had fallen on Pearl Harbor, 3,600 Americans had been killed or wounded. Five ships were destroyed and most others were severely damaged. In addition, almost all U.S. airplanes had been rendered useless by the *Zero* fighters' strafing attacks.

In tactical terms, the Japanese had scored an immense victory with negligible losses to their own forces. In strategic terms, historians argue that Pearl Harbor was a blunder. All of the American aircraft carriers were at sea, leaving intact a part of the Pacific Fleet that would become the most vital fighting force of World War II. Also, the Japanese had not destroyed as many ships as they first believed. Lastly, they missed many repair facilities and fuel tanks at Pearl Harbor, allowing the base to provide support for incoming ships.

Historians agree that if Admiral Nagumo had not decided against a second attack on the base as Commander Fuchida had urged, the outcome of the Pacific War might have been decidedly different.

Japan Takes the Pacific (December 1941 - April 1942)

While Pearl Harbor was still blazing, Japan pounded other targets in the Pacific and Eastern Asia. Meticulously planned attacks and movements began within the same day in Malaya, Wake and Guam.

First, troops under the command of General Tomoyuki Yamashita (soon to be known as the "Tiger of Malaya") embarked on a 650-mile trek. They planned to land in Southern Thailand and push 200,000 men south through the humid Malayan jungle to capture Singapore.

At the same time, a Wake radioman was listening to the unbelievable distress signals coming from Oahu's Hickman field. He relayed the emergency message to the troops on the island, and all 400 Marines scrambled to their battle stations for an attack that would come in a matter of hours and last over two weeks.

Just as Wake was preparing for the Japanese, underarmed forces in Guam watched in disbelief as Imperial bombers unleashed destruction on the small island. Three days later, an invasion force landed and captured all 555 surviving Americans.

Finally, the British battleships *Prince of Wales* and *Repulse* left Singapore on a mission to break up convoy runs between Malaya and Indonesia. Since the carrier *Indomitable* had beached herself earlier in the East Indies, the fleet had no air cover. This proved unfortunate two days later, when Japanese subs sighted the battleships and dispatched a fleet of bombers to meet the British. After a night of fruitless searching, Imperial pilots finally found the ships. Within hours, merciless bombs and torpedoes sank both the *Repulse* and *Prince of Wales* — conclusively demonstrating the vulnerability of ships without air support.

Japan seemed unstoppable. Guam and Wake both fell to the invaders, and Yamashita's army confidently advanced upon Singapore. When they finally reached the Royal Navy stronghold, the Japanese were exhausted and short of supplies. To their amazement, the British surrendered the fortress city following a brief fight. Thus had fallen "the Gibraltar of the Pacific" after a mere 70-day campaign through Southern Thailand.

The Japanese were also advancing on the one American bastion in Southeast Asia — the Philippines. At Clark and Nichols fields, General Douglas MacArthur's air force was taken by surprise in a repeat performance of Pearl Harbor. Entire airplane squadrons were shot up on the ground by strafing *Zero* fighters flying from Taiwan. Japanese invasion forces quickly pushed back the Filipino and American defenders, who retreated to the Bataan Peninsula to make their last stand.

Desperate, MacArthur demanded reinforcements that would not come. Roosevelt, fully aware that the U.S. could not possibly hold the Philippines, ordered MacArthur to flee to Australia in March. He escaped with his top staff, wife and son, vehemently promising that he would return to the Philippines. He would, but too late for the weary men holed up in the Bataan Peninsula.

MacArthur's troops, now under the command of General Wainwright, finally retreated even further to Corregidor, a heavily fortified island off Bataan that had once served as a Spanish prison. As they ran out of food and supplies, however, resistance became futile. At last, the hungry, haggard forces at Corregidor dejectedly surrendered to the Japanese army. The Japanese captors treated their POWs brutally, marching them to concentration camps in a nightmarish journey that was later referred to as the Bataan Death March. Over 20,000 men died from starvation, thirst, abuse and disease, adding fuel to the swelling Allied hatred toward Japan. Finally, the Philippines had fallen prey to the Rising Sun.

Progressing quickly to the Dutch East Indies, the Japanese crushed the feeble resistance put up by the ABDACOM (the American-British-Dutch-Australian Allied Command). Meanwhile, the Japanese launched air raids against Java and Burma.

The victorious Japanese were not content with overrunning Southeast Asia. The same carrier fleet that had prevailed at Pearl Harbor now sailed toward India, raiding the British stronghold of Colombo in Ceylon. Carrier pilots sank the battleships *Cornwall* and *Dorsetshire*, as well as the aircraft carrier *Hermes*.

Striking Back: The Doolittle Raid (April 1942)

In only four months, the Japanese had won one stunning victory after another, sinking a vital part of the Allies' naval forces without suffering major damage to their own forces. India, too, was now threatened by the seemingly unstoppable Japanese advance.

Disheartened and tired, the Allies badly needed to boost morale at home and with their troops. American carrier raids in the Gilbert and Marshall islands met with partial success, but could hardly compare to the Japanese onslaught sweeping across Southeast Asia. Something had to be done.

To jolt the Japanese government, Roosevelt wanted to bomb Japan itself. The problematic question was how to get bombers close enough to do the job.

Lieutenant Colonel "Jimmy" Doolittle solved the Navy's problem by proving that a B-25 bomber could take off within a mere 500 feet — the length of an aircraft carrier's deck. A carrier might be able to get close enough to Japan to launch the air raid, and the big bombers had the range to fly to Japan, make their attacks, and then continue to safety in China.

During the midday attack on April 18, B-25s under Doolittle's command launched from the *Hornet* and pelted the Japanese homeland in an attack that astonished the Japanese military. Called the "Doolittle Raid," it was not particularly rewarding strategically, but it had far-reaching psychological consequences for both sides. The Japanese were outraged at what they saw as a personal affront to their Emperor, while the United States enthusiastically greeted the news as a first sign of hope after four months of defeat.

The Coral Sea and Midway (May - June 1942)

The Japanese victories from December 1941 through April 1942 left the leaders of the Imperial Japanese forces exhilarated and overconfident. Having achieved most of their goals with minimal losses, they now had to decide where to move next.

Initially, the Japanese Navy voted to attack Australia in order to keep the U.S. from using it as a base for a counteroffensive in the southwest Pacific. However, Admiral Osami Nagano argued that Imperial troops were already widely dispersed. Instead, he wanted to capture Port Moresby in New Guinea and Tulagi in the Solomons. These moves would isolate the shipping lanes from Australia and, at the same time, provide an ideal base for attacking New Caledonia, Samoa and the Fiji Islands.

Admiral Yamamoto, meanwhile, was concerned with the potent threat of an intact U.S. carrier fleet. Originally opposed to war with the U.S., he convinced his colleagues that a decisive sea battle was needed to eliminate the remaining U.S. Pacific fleet. With these two goals — the capture of Port Moresby and Tulagi, and the staging of a cataclysmic carrier battle — the Japanese military leaders set to work. The resulting plan was called Operation Moresby, “MO” for short.

In late April 1942, shortly after the Doolittle Raid, Japan advanced toward its first goal by moving into the southern Solomons and New Guinea. The small aircraft carrier *Shoho* and an accompanying fleet set sail for Tulagi. By May 3, Japan occupied the island, in spite of several American strikes by carrier-based *Dauntless* and *Devastator* bombers. American planes sank a destroyer and several other Japanese ships, but eliminated the element of surprise when they revealed their presence to the Japanese. For the next two days, both sides sought each others’ fleets in vain.

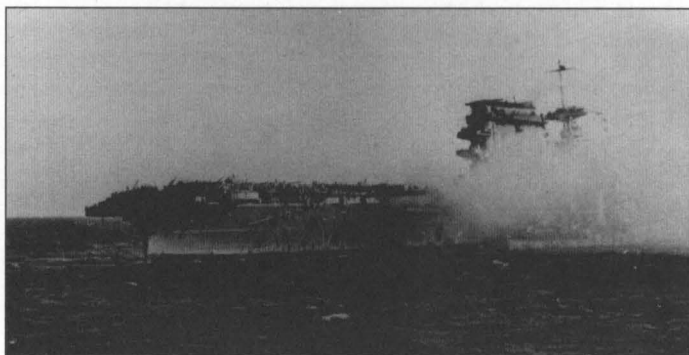
Simultaneously, a larger force with the carriers *Shokaku* and *Zuikaku* was heading for Port Moresby from Truk. But unknown to the Japanese, Admiral Nimitz had accurately discerned the Imperial intentions and sent the *Yorktown* and *Lexington* into the Coral Sea to wait for the Japanese fleet.

Days later, the blundering Battle of the Coral Sea would become the first conflict fought totally by aircraft carriers.

— ★ —

Hundreds of crew members abandon the USS Lexington after an oil leak sparks a spectacular explosion.
(1942)

— ★ —



The Coral Sea (May 1942)

On May 7, a Japanese scout plane spotted what it thought was a U.S. carrier and cruiser near Guadalcanal. Immediately, Rear Admiral Hara (commander of the *Shokaku* and *Zuikaku*) launched a 69-plane attack. Both of the American ships were destroyed, but they were not part of a carrier fleet. Instead, the Japanese sank the tanker *USS Neosho* and the destroyer *Sims*.

Following suit, U.S. scout planes from the *Yorktown* detected a Japanese carrier and four large cruisers to the north. Admiral Fletcher knew from intelligence reports that two Japanese carriers were in the area, and he suspected that a third was also present. Since he knew the whereabouts of one vessel, Fletcher launched a 93-plane attack against the light carrier *Shoho* to the north. The *Yorktown* bombers arrived first, but the *Lexington* squadrons that had drifted off course soon caught up with them.

The Japanese fleet was caught off-guard when the American planes descended. The *Shoho* could not withstand the hail of bombs and torpedoes that rained down. Soon after the attack, Lt. Commander Bob Dixon radioed his famous message to his carrier: "Scratch one flattop, Dixon to carrier, scratch one flattop!" For the first time in history, a Japanese carrier had been sunk, foiling the planned attack on Port Moresby.

Upon learning this news, Admiral Takagi of the *Shokaku* ordered additional planes into the air to launch a counterstrike. He sent 27 bombers out late that afternoon in search of the American carriers. Fortunately for the U.S., stormy weather and darkness prevented most of the Japanese planes from making it back to their ships. Those that ventured too close to the U.S. carriers were gunned down, while others crashed into the sea trying to land on the swaying carriers. Several planes even mistook the U.S. carriers for their own.

The following day, both sides launched scouting forces. Just as U.S. planes spotted the fleet led by the *Shokaku* and *Zuikaku*, Japanese scout planes discovered that the *Lexington* was located 170 miles south of the Imperial forces. The Japanese launched their attack planes first, but it was the U.S. bomber force that conducted the first strike. The two strike squadrons passed each other as they sped to their targets.

Devastator bombers from the *Yorktown* descended on the *Shokaku*. Forced to launch their torpedoes from too far away, they scored no hits. Soon, another wave of bombers appeared. Plagued by foggy canopies, the arriving *Dauntless* pilots made a series of blind bombing dives. One pilot, Lt. John Powers, had vowed to sink an enemy carrier and swooped 300 feet above the carrier deck before releasing his bomb. The resulting explosion led to his death (for which he received the first posthumous Medal of Honor) and caused the vessel to catch fire. This prevented the *Shokaku* from launching more planes, although the U.S. planes lost the escaping *Zuikaku* in a rain squall.

Not long after, a squad of 69 Imperial bombers and fighters countered the strike with an attack on the *Yorktown* and *Lexington*. The Americans only had 17 fighters

and patrolling dive bombers to protect the carriers and had to depend on skill and pure luck. When the last enemy plane departed, the *Yorktown* had escaped with one bomb hit that severely damaged the deck and killed 65 crew members. The *Lexington* was not so lucky.

After several direct torpedo and bomb hits, the *Lexington* limped away from the battle. Just as crew members thought that the damage was under control, a leak in the oil lines fueled a spectacular explosion. Within minutes, the entire ship was ablaze. The captain immediately ordered his men to abandon ship, and the *Lexington* was scuttled to the depths of the Pacific by the destroyer *USS Phelps*.

Tactically, the Japanese claimed victory in the Coral Sea. After all, the Americans had lost one fleet carrier, while the Japanese had only sacrificed the light carrier *Shoho*. In the strategic sense, however, this “victory” forever postponed the assault on Port Moresby.

Midway (June 1942)

Undaunted by this setback, Admiral Yamamoto continued to plan his momentous carrier battle. He chose the atoll of Midway as his potential site. Attacking Midway, he presumed, would provoke the U.S. into battle since the island was a vital defense point for protecting the island of Hawaii. His intricate plan involved a diversionary attack on the Aleutians and, the next day, a series of air strikes followed by the invasion of Midway. This attack would secure the tiny island and lure U.S. carriers into a battle that would rob the Americans of all naval power.

As in the attack on Pearl Harbor, Japanese success depended on the element of surprise and the careful coordination of all movements. What Yamamoto did not know was that the Americans had cracked his coded naval plans to attack Midway.

Admiral Nimitz knew that the Japanese were planning a major operation they were referring to as “AF,” which he believed to be an attack on Midway. To confirm his suspicions, he instructed Midway to send a false message about a mechanical failure in their distillation plant. A few days later, American cryptanalysts picked up a message discussing the “water shortage in AF.” The Japanese had taken the bait, and this time, the Americans were steeled against the attack.

In preparation of the invasion, the U.S. heavily fortified Midway’s defense works and sent in additional troops and airplanes. The aircraft on Midway were supposed to ward off the Japanese and could be used to attack the supporting Imperial carriers. As added defense, the hastily repaired *Yorktown* was en route to the island to join the *Enterprise* and *Hornet*.

Admiral Nagumo headed up the Japanese attack and when his 108 planes attacked Midway, they encountered Marine *Buffalo* fighters. Japanese squadrons shot down many of the U.S. planes and bombed the base, but the runway remained intact.

Nagumo was in a predicament — although he wanted to launch a second strike, he was worried that U.S. vessels might arrive while his planes were away. He had

reserved several of his best torpedo and dive bombers and escorting *Zeros* in case this happened. Still, he was fairly confident of victory; his naval strike force had four carriers, many planes and well-armed support ships.

Meanwhile, Midway-based U.S. aircraft — launched before the Japanese attack — droned toward the Imperial fleet and vainly attacked Nagumo's armada. They did no serious damage and were easily squelched by the superior Japanese fighter cover and anti-aircraft fire. Nagumo then ordered the ground crews to arm all available aircraft with bombs for the second ground strike. The rearming efforts were well underway when a Japanese search plane sighted an American fleet.

This was unnerving news for Nagumo, who wasn't sure whether this force included aircraft carriers. Frantically, he ordered the second wave of planes unloaded and rearmed with armor piercing bombs and torpedoes.

An hour later, news sifted in that U.S. carriers had been sighted. This information hit Nagumo's fleet just as the first wave of planes returned from Midway. Nagumo had to choose whether to finish rearming the bomb-laden planes with torpedoes or let the incoming planes land. His fighters badly needed refueling before they could escort the second attack force. Finally, he made the fateful decision to land the first group.

As the Japanese scurried to move the second group back into the hangar, 35 dive bombers, 54 torpedo bombers and 12 *Zeros* crowded the flight deck. The hangar, too, was jammed with stacks of unloaded bombs that were fused and ready. To Nagumo's dismay, American planes appeared on the horizon.

Earlier that morning, Admiral Spruance of the *Enterprise* and *Hornet* had launched 152 aircraft in an attempt to catch the Japanese fleet as they were landing planes from the Midway attack. But Nagumo had abruptly changed course, and the first U.S. bombers were unable to locate the fleet. Now, 15 *Devastator* torpedo bombers had finally arrived from the *Hornet* and were attacking the fleet without U.S. fighter support.



— ★ —
Two SBD
Dauntless
dive bombers
fly in tight
formation
during the
Battle of
Midway.
(1942)
— ★ —

Zeros from Nagumo's ships quickly eliminated all 15 planes. Nagumo seemed on the edge of victory and was once more preparing to launch a massive air strike when *Devastator* torpedo planes from the *Yorktown* and the *Enterprise* flew onto the scene. Almost all of them were shot down, but not before a high-flying wave of dive bombers entered the arena. Since the low-flying torpedo planes provided a useful diversion to the Japanese combat air patrols, the *Dauntless* bombers were able to score hit after hit on the Japanese carriers and destroyed all but one. By the time they finished, the *Akagi*, *Kaga* and *Soryu* were left ablaze and sinking. One pilot referred to the sea-level air war as a beehive, with planes striking and falling from every direction.

While the other Imperial carriers were being turned into blazing infernos, the *Hiryu* had temporarily escaped the Allies. Admiral Yamaguchi, commander of the surviving vessel, desperately launched a counterstrike of *Kates*, *Vals* and *Zeros* against the *Yorktown*. Bombs and a torpedo ripped through the *Yorktown*, but dive bombers from the *Enterprise* managed to sink the *Hiryu*.

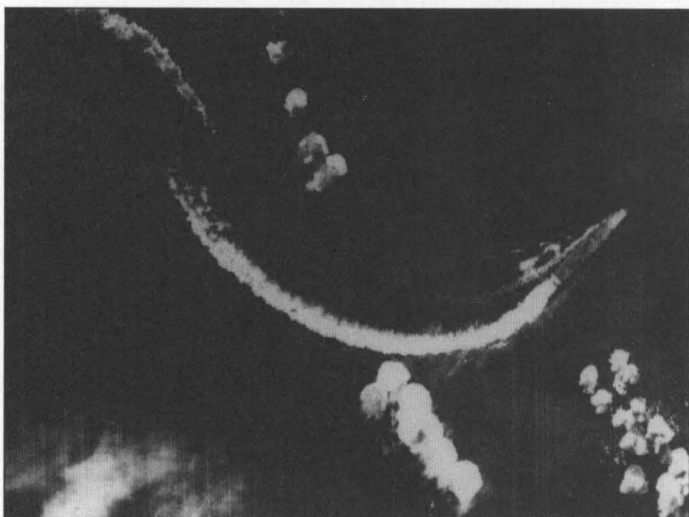
In only one day, the tide had turned. The United States had killed 3,500 Japanese and destroyed four carriers and over 300 planes, in contrast to its 300 casualties and one lost carrier. The Battle of Midway inflicted a crushing defeat on the Imperial Japanese Navy — a defeat from which it would never recover.

Midway also had subtle consequences that contributed to the Imperial downfall. When the carriers sank, the Imperials lost a number of good planes and pilots — this was the tragedy at Midway for the Japanese. Without a modern training program, those pilots proved to be irreplaceable. Also, the Allies captured a downed *Zero* during the diversionary attack on the Aleutians. Studying the innovative technology behind its design ultimately allowed the Americans to develop aircraft that could stand up to its superior maneuverability.

— ★ —

The Japanese carrier *Akagi* veers left in vain to dodge a hail of American bombs during the Battle of Midway. (1942)

— ★ —



The Solomon Islands (May 1942 - April 1943)

The Battle of Midway halted the previously unstoppable spread of Japanese victories across the Pacific. With this decisive victory, Allied forces regained much-needed morale at home and among their troops. Next, they concentrated on stopping the Japanese attempts to isolate Australia, already begun in Tulagi and the Coral Sea.

After Midway, the Japanese moved into Guadalcanal and began to construct an airfield that threatened the naval supply lines of Australia. Since this landing strip was close to the Coral Sea, it could also threaten any future American naval operations there. Fortunately for the U.S., Guadalcanal was home to many Coastwatchers — Australians and British that stayed in hiding and informed the Allies of Japanese movements. One such man, Martin Clemens, radioed that the Japanese were building an airfield on the island.

Guadalcanal: The First Step (August 1942)

About the same time, U.S. military leaders developed a follow-up operation to Midway, codenamed "Watchtower." The Americans hoped to drive the Japanese out of Guadalcanal and gradually advance to Rabaul, the main Japanese stronghold in the South Pacific. The first Watchtower strike came on August 7, 1942, when dive bombers and fighters attacked Guadalcanal. Landing craft brought thousands of camp-fresh Marines swarming onto the beach. The surprised Japanese abandoned the unfinished airstrip halfway through lunch and by late afternoon, the Americans held sole control of the field and the immediate surrounding area. They named it Henderson Field, after one of the pilots killed at Midway.

In the air, the fighting was not so lopsidedly in favor of the Americans. U.S. transports, carrying supplies desperately needed to support the invading Marines, were about to come under sustained attack by twin-engined *Betty* bombers escorted by *Zeros*.

The planes were manned by some of the most experienced and talented aircrews of the Imperial Navy. By the time the action died down, the first confrontation cost the Japanese five *Bettys* and two *Zeros*, countered by an Allied loss of eight *Wildcats* and one *Dauntless*. The next day, Japan lost 18 out of 23 torpedo-armed *Bettys* when they unsuccessfully attacked the American invasion fleet at Guadalcanal.

The second evening of the battle, Vice Admiral Mikawa slipped five heavy cruisers, two light cruisers and a destroyer through "The Slot," a narrow passage in the Solomon Islands. Around midnight, his formidable fleet happened upon five U.S. cruisers and several destroyers sitting placidly off Savo Island.

Hidden under the cover of a black, humid night, the Imperial ships began to shell the unsuspecting Allied vessels. Within thirty minutes, the Japanese had sunk four cruisers and severely damaged the fifth with their oxygen-propelled Long Lance torpedoes. Later, this battle was dubbed the "Battle of the Five Sitting Ducks." It was one of the worst defeats ever suffered by the U.S. Navy.

Stalemates in the Sea and Air (August - October 1942)

In the coming months, Guadalcanal would evolve into a stalemate. On land, neither side had enough strength to force the other side to surrender. From the Imperial perspective, this problem was compounded by Japan's tendency to underestimate the number of American troops on this island — thus, the Japanese continually failed to send sufficient reinforcements.

At sea, they traded control — in daylight, the Americans ruled the waters near Guadalcanal, due to their command of the air; at night, the Japanese took over. Their cruisers and battleships bombarded American positions during the night, only to retreat before the rising sun exposed their decks to attacks by marauding bombers.

There was yet another stalemate in the air. Marine pilots, flying from Henderson Field, were outnumbered but had the advantage of operating close to their base. The Japanese air force was larger, but operating near the end of its range.

In the end, it became a battle of endurance — which side would collapse first, which force would first run out of supplies, or which army would lose the will to continue the fight.

For the men on the island, time became a hellish stretch of days and nights interrupted by gunfire and explosions. The Japanese shelled the U.S. forces incessantly and bombed the airfield on a daily basis. Food was scarce and troops were plagued by a variety of tropical diseases. Almost daily, the Marine forces had to ward off Japanese infantry.

Yamamoto's Plan (Late August 1942)

Admiral Yamamoto knew that the Japanese needed reinforcements and supplies on Guadalcanal, but they could not easily be delivered with the U.S. Pacific Fleet in the immediate area. Therefore, he came up with a two-fold plan. First, he wanted to engage the U.S. fleet and knock out the American carriers. Once this was done, the Japanese Navy could safely reinforce the island. Secondly, Yamamoto needed to neutralize Henderson Field to protect the Japanese fleets during the operation.

In implementing these attacks, Yamamoto placed a main strike force north of Guadalcanal (including the heavy carriers *Shokaku* and *Zuikaku* and the battleship *Yamato*) to find and sink the U.S. carriers. He also sent the light carrier *Rjuyo*, whose mission was to launch planes against Henderson Field.

While Yamamoto planned the carrier battle, Rear Admiral Tanaka was busy organizing the "Tokyo Express," a series of runs by transport ships that would land troops and supplies on Guadalcanal. Working with the Imperial Navy, he planned a massive run that would occur during the naval diversion created by Yamamoto. After the Americans moved north toward Yamamoto's fleets (away from Guadalcanal), Tanaka's transports could easily land.

Meanwhile, Rear Admiral Frank Fletcher was patrolling the eastern Solomon Islands with several task forces, including the U.S. carriers *Saratoga* and *Enterprise*.

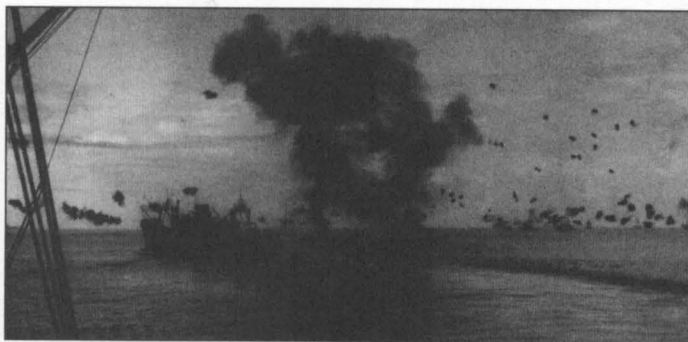
HISTORICAL OVERVIEW

The carriers were spread out over four fleets and supported by hundreds of aircraft. On August 24, Fletcher's dive bombers discovered the *Rjuyo* fleet. The Japanese carrier was without adequate air protection, having launched its attack on Henderson Field. The American bombers attacked the ship, fatally damaging it with several 1000-pound bombs and a torpedo. At the same time, Marine fighters repelled the air attack at Henderson Field.

Vice Admiral Kondo also had a fleet in the immediate area of the Solomon Islands. When his ships sighted the American carriers, he decided to attack. When Kondo's dive bombers arrived, they found 50 *Wildcats* airborne and waiting for the attack. The fighters and anti-aircraft fire dealt with most of the Imperial planes, although several *Val* bombers broke through the defense and dropped three bombs on the *Enterprise*. The flight deck was damaged, but the carrier managed to escape to safety. The *Saratoga* avoided any direct hits. By twilight, the naval Battle of the Eastern Solomons was complete.

Even as the carrier battle was being fought, Tanaka followed his plan, pressing his Tokyo Express transports on to Guadalcanal. He was confident of success after receiving exaggerated figures from Japanese pilots, who claimed that three U.S. carriers had been sunk. Upon his arrival, Tanaka was swarmed by a squadron of dive bombers from Henderson Field, which scored direct hits on his flagship, the *Jintsu*, and on the transport vessel *Kinryu Maru*. The *Jintsu* retreated, while the *Kinryu Maru* and a destroyer were later sunk by Army bombers. Six days later, a Japanese submarine torpedoed and badly injured the *Saratoga*.

The Battle of the Eastern Solomons was a narrow American victory. For a battle whose intent was to knock out a carrier force, the destruction was mild. Between August 24 and 31, neither side scored any major kills. Two of the four American carriers were put out of action, leaving the *Wasp* and *Hornet* as the only carriers in that region of the Pacific. The *Enterprise* was sent to Pearl Harbor to be repaired. Japan lost the light carrier *Rjuyo*, a transport ship and a destroyer, but its two heavy carriers emerged unscathed. The greatest setback for the Imperial forces was that the U.S. downed some of the most experienced aircrews the Navy had to offer and prevented most of Japan's reinforcements from landing on Guadalcanal. Although ships and lives had been lost, the tug of war over the island was still far from over.



— ★ —
Explosions and smoke from a stricken vessel obscure the horizon during the Battle of the Eastern Solomons.
(1942)
— ★ —

Bloody Ridge (September 1942)

Tanaka had retired to Rabaul, deciding that the Tokyo Express runs were suicidal during the day due to the Henderson Field bombers. The runs continued at night, however, delivering troops and supplies to the island. The Japanese Army's latest strategy called for troops to move in on the airstrip in a pincer movement, attacking Henderson Field from both the east and west.

When they struck on September 12, over 5,000 Japanese soldiers attacked the U.S. Marines during the battle for "Bloody Ridge." American forces entrenched themselves in the ridge overlooking Henderson Field and were able to stand their ground in a gruesome fight against the advancing land forces. By dawn, over 600 Japanese soldiers had lost their lives, while 260 Americans were killed or wounded. Still, the Tokyo Express brought in fresh supplies and troops.

The Americans also received reinforcements, with the 7th Marine Regiment delivering 4,000 men under cover of the repaired carrier *Wasp* and the battleship *North Carolina*. Although the troops arrived safely, the *Wasp* was struck by three torpedoes on September 15 and slowly sank.

A month later, Imperial Army Lt. General Hyakutake landed more reinforcements on the island. Likewise, the American carrier *Hornet* and its fleet arrived, headed by Rear Admiral George Murray. Its purpose was to protect American landing transport ships and end the nightly runs of the "Tokyo Express." The Japanese Navy also sent another cruiser and destroyer force into the area. In October, the two navies met in a confusing head-on clash as the Imperial Navy attempted to wrest the island from the Americans yet again.

Cape Esperance (October 1942)

The Battle of Cape Esperance (west of Savo Island) began when Rear Admiral Norman Scott's forces detected an incoming fleet on radar. Unsure whether the vessels were friend or foe, the cruiser *Helena* tracked the ships for 10 minutes. Without Scott's permission, the cruiser's captain opened fire on the fleet. The Japanese force was caught by surprise as the American shelled the cruiser *Aoba* and sank the cruiser *Furutaka* and the destroyer *Fubuki*.

Confusion set in as a Japanese cruiser and destroyer turned away from battle, and immediately encountered the *USS Duncan*. Other American cruisers in the area began firing, and in the commotion, the *Duncan* was terminally set on fire. Trying to identify the enemy, the light cruiser *Boise* turned on its searchlights and was shrouded by gunfire. Finally, Scott abandoned the battle. The Americans claimed numerical victory, since three Allied ships were sunk to Japan's eight. However, the Tokyo Express had safely dispensed its troops and supplies on Guadalcanal.

In the next two weeks, Japan demolished the beachhead near Henderson Field with thousands of shells during a series of nightly sea-to-ground bombardments, turning it into a crater-stricken battlefield. On October 23, they launched a massive ground assault against the U.S. troops. Still, the steadfast Marines held their ground. Three days later, Hyakutake withdrew into the jungle, having lost over 3,400 men.

Santa Cruz (October 1942)

Back in Pearl Harbor, Admiral Nimitz was unhappy with the Navy's progress in the Pacific. He finally decided that the only way to gain control of the seas surrounding Guadalcanal was to assign a more aggressive commander to the arena. Thus, Admiral Bill Halsey moved in to take over the Carrier 2 Division.

Meanwhile, Admiral Kondo was approaching Guadalcanal with four battleships and five carriers. Unaware of Hyakutake's movements, he thought that the Army would have taken Henderson Field by this time. He expected the Navy to drive off the American fleet so that he could assist Japanese soldiers in mopping up Guadalcanal.

Deciding to intercept Kondo's force, Halsey led the newly repaired *Enterprise* into battle and was joined by Admiral Kinkaid (with the *Wasp* and *Hornet*), who had recently relieved Rear Admiral George Murray. After several days of playing "cat-and-mouse," the U.S. and Japanese carriers launched simultaneous air strikes. The groups passed each other on the way to their targets. Sixty-seven Japanese planes streaked toward the American fleet, while 73 bombers and fighters headed for the Imperial vessels.

While *Wildcats* kept the *Zero* fighters busy, American bombers scored strikes on the carriers *Shokaku* and *Zuiho*. Meanwhile, back at the American fleet, the *Hornet* was hit by bombs, torpedoes and two crashing planes. A second wave of Japanese planes dropped two bombs on the *Enterprise*, and a third flight struck the battleship *South Dakota* and the cruiser *San Juan*.

The day-long Battle of Santa Cruz ended as the moderately injured *Enterprise* landed its aircraft. Later, the *Hornet* succumbed to torpedoes. Even though the battle was a tactical victory for the Japanese, they continued to suffer severe losses in both equipment and men. Although the Japanese still had two operable carriers, the U.S. forces destroyed so many aircraft that there were only enough to fill half of the available hangar space. Also, the *Dauntlesses* that had targeted the *Shokaku* inflicted damage that would take nine months to repair. Furthermore, it was a strategic defeat for the Japanese — they failed to gain command of the sea.

Naval Battle of Guadalcanal (November 1942)

In two weeks, Yamamoto renewed his attack in the naval battle of Guadalcanal. He sent Kondo's fleet north of Guadalcanal and dispatched another task force on a mission to obliterate Henderson Field. Additionally, he positioned Tanaka's fleet just north of the American-held beachhead. When these forces clashed with Rear Admiral Scott's forces, the bloody engagement cost the Americans two cruisers and six destroyers.

First, the Imperial battleship *Hiei* (accidentally helped by the USS *San Francisco*) knocked out the bridge on the flagship *Atlanta*, claiming Scott's life. Then, another admiral on the *San Francisco* was killed by shells from the *Hiei*. Eight American destroyers, however, managed to hit the *Hiei* over 50 times. Later, the *Hiei* was scuttled and became the first Imperial battleship to be sunk in the war. Although four American destroyers were lost, they were able to sink two Japanese cruisers.

Yamamoto had failed so far in his plan to take over the seas near Guadalcanal. Now, he had one task force left (under Kondo) with which to attack the American fleets. The ensuing night bombardment on Henderson Field was thwarted by the battleships *Washington* and *South Dakota* and several destroyers. Although the *South Dakota* was hit, the *Washington* managed to terminally damage the battleship *Kirishima*, causing Kondo to flee the battle.

At the same time, Kinkaid's fleet (with the damaged *Enterprise*) attacked Tanaka's transport ships, sinking seven out of eleven. The other four were destroyed the next morning by U.S. bombers when the transports landed west of Henderson Field.

As the U.S. continued to hinder supply lines, Japan withdrew all remaining troops from "Starvation Island." The Japanese had lost close to a thousand planes and over two thousand of their most experienced airmen to the bitter fighting. Coupled with limited resources, these disastrous losses would ultimately seal Japan's fate.

Moving Toward Rabaul (April-November 1943)

Guadalcanal formed the first toehold for American troops, providing a base for further offensives up the chain of Solomon Islands leading to the Japanese base at Rabaul. American military leaders hoped to use Guadalcanal and Bougainville, a large barrier island, as stepping stones to the city.

The American Navy worked its way up to Rabaul in a series of land, sea and air operations. The Japanese fought back doggedly, often resorting to hand-to-hand combat and brutal jungle warfare. The invasion of Bougainville, next to Rabaul, prompted the Japanese to gather a naval force at Rabaul to ward off the attackers.

With Bougainville secured, the Allies began closing in on Rabaul. The Americans sent the carriers *Saratoga* and *Independence* out to catch the Japanese naval vessels while they were still moored in Rabaul's harbor. Launching over 100 aircraft, the Allies managed to sink so many ships that an Imperial counter-attack had to be canceled. The Japanese then scattered their ships and retreated to Truk — their main naval base in the Central Pacific.

— ★ —

A TBM

Avenger sits
placidly on
a Guadalcanal
airfield
fringed with
tropical palms.

(1942)

— ★ —



The Thrust into the Central Pacific (April 1943 - March 1944)

Tremendous American resources allowed the U.S. to replace destroyed ships and aircraft fairly quickly after Rabaul. The Allies bolstered their carrier fleet with nine newly constructed carriers. Four of them (all in the 27,000-lb. *Essex* class) could carry over 80 aircraft and utilize sophisticated air-search radar and improved transportation elevators. The others were modeled after the smaller *Independence* class and were capable of carrying just under 50 aircraft.

Besides improving its ships, the U.S. also made significant advances in aircraft production: in 1943, the American forces had 18,000 aircraft at their disposal. A year later, those numbers would nearly double. The Japanese military industry, on the other hand, was already stretched to the limit after Guadalcanal. Plane production slowed due to U.S. subs strangling the Japanese wartime supply lines. Also, Japan's Imperial Navy could not replace its dead veteran pilots.

Before the inception of the war, Admiral Yamamoto had warned Japan of the American industrial potential. Now, it was becoming evident that this superiority in both technological resources and manpower would ultimately defeat the Imperial Japanese Navy.

Twin Offensives Launched (April - September 1943)

The U.S. Joint Chiefs of Staff were plotting a divided attack against Japan. They decided to implement both MacArthur's and Nimitz' operations simultaneously, causing the Imperial Navy to split its forces. While MacArthur was moving forward in New Guinea, the Pacific Fleet, under the command of Vice Admiral Raymond Spruance, was preparing to advance across the Central Pacific. The two prongs would eventually meet and press on to attack the Japanese mainland.

While the U.S. Navy concentrated on attacking the heart of the Imperial Navy, General MacArthur (commander of the U.S. and Australian forces in the western portion of the Pacific) was struggling with Japanese Army forces in New Guinea. By this time, New Guinea was largely in Japanese hands. The exception was Port Moresby, whose takeover was foiled during the first Japanese attempt to flush the Allied forces out of New Guinea. In a series of assaults, MacArthur's forces stamped out the Japanese Army forces and proceeded to move up the coast toward Salamaua, Lae, Morotai and Hollandia. Repeated attempts to reinforce Imperial troops in New Guinea were thwarted by continuous Allied air raids on ground installations, airfields and transports. By September 1943, Americans controlled the island. At last, the way was clear for MacArthur's return to the Philippines.

Also in April, the Americans inflicted a crushing blow to Japanese morale with the death of Admiral Isoroku Yamamoto. American cryptoanalysts had decoded his plan to visit troops in the Solomon Islands. When he arrived for his one-day tour, P-38 fighters from Henderson Field were launched in a carefully timed interception. In a short attack, they downed Yamamoto's plane over the jungle and killed the admiral.

Island-Hopping to Truk (November 1943 - February 1944)

Unlike Japan, the U.S. was more concerned with saving lives than holding every island in the Pacific. Since island invasions resulted in so many casualties, the Navy elected to take only certain strategic sites. Called "island hopping," this military tactic passed over heavily fortified Japanese islands in favor of carefully selected toeholds. Another tactic the U.S. used during island invasions was naval bombardment. Before troops were landed onshore, the Navy would batter the enemy's installations and bunkers for weeks with heavy gunfire.

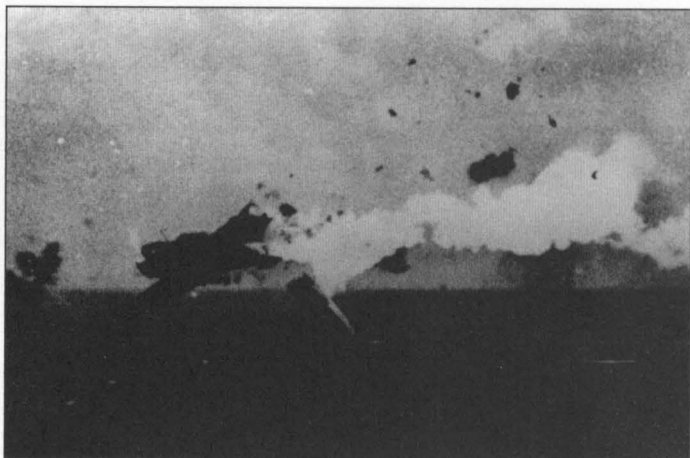
On November 23, 1943, Spruance launched Operation Galvanic, the invasion of Tarawa and Makin islands in the Gilbert Islands. The attack was preceded by an extended naval bombardment, allowing the Marines to move ashore. The Japanese resisted this attack with radical determination. Once again, land battles took a terrible toll, killing 8,000 Japanese. It cost the American troops three days and over 3,000 lives to capture Tarawa, a stepping stone to Truk.

After conquering Tarawa, the Navy bombarded Kwajalein in the Marshall Islands for days before the invasion. Through pounding surf and a jagged reef, the Marines were able to move ashore and take the island. Similarly, the U.S. forces captured Eniwetok in three days by using air attacks followed by ground troops. Although the island was a labyrinth of trenches and foxholes, the bombardments had shell-shocked the Japanese troops. Besides destroying ground installations, the air attacks obliterated 32 ships and 250 planes, severely hindering Japan's already weakened air power.

By mid-February 1944, it was easy to unleash American airpower on the Japanese naval base at Truk. After a series of air attacks by the U.S., the Japanese forces abandoned the base. This U.S. milestone, coupled with victory in the Marshall Islands, completed the American campaign to cross the Central Pacific. From here, the ensuing Marianas campaign would inflict a crushing defeat on the Japanese and put an end to their rule in the Pacific.

— ★ —
*In its final
 seconds of
 flight, this fiery
 Kate torpedo
 bomber loses
 its left wing
 and heads for a
 watery grave.
 (1943)*

— ★ —



The Marianas and Philippines: The Curtain Falls (June - October 1944)

Now that the Navy had completed its move across the Central Pacific, Vice-Admiral Raymond Spruance decided to make a stabbing attack on the Mariana Islands with his Fifth Fleet. In June 1944, he planned to invade Saipan, an island stronghold that would put long-range bombers within striking distance of Japan.

The Japanese naval goal remained the same — to destroy the American Pacific fleet at all costs. The Imperial leaders anticipated the next attack to occur in the oil-rich Dutch Indies or Truk, and fortified those areas accordingly. They hoped to stop the advancing Allied forces with new armored-deck carriers and long-range bombers (*Jill* and *Judy*). Even the *Zeros* had been improved, featuring new pilot-protective armor and self-sealing fuel tanks. The land-based fighter *George* also was deployed to the area. With these improved ships and planes, the Japanese believed that they could repel any American attack. Wherever the U.S. struck, the Japanese planned to meet the U.S. fleet with both carrier-based and land-based planes. But once again, the Japanese would underestimate the Americans; the U.S. carrier fleet featured 15 carriers and almost 900 aircraft, roughly twice that of the Japanese.



— ★ —
Six Dauntless
dive bombers
launched in
the Philippines
undertake
another
risky mission.
(1944)

— ★ —

The Philippine Sea (June 1944)

Moving into Saipan, the Americans enacted a preemptive strike on the airfields in the Mariana Islands. By destroying the landing strips in Saipan, Rota and Guam, the U.S. Navy hoped to immobilize the land-based air squadrons. Since Admiral Ozawa had planned to coordinate his naval air attacks with these land-based airplanes, his strategy would be thwarted. In fact, Ozawa was unaware of the U.S. attacks on the airfields even as he made his strike against the Americans.

On June 18, 1944, U.S. submarines spotted and engaged one of the main Japanese fleets west of Saipan, sinking the *Shokaku* and damaging another carrier that would later explode. Later that morning, Ozawa dispatched over 300 long-range planes to attack the U.S. fleet. Because of their range, the Japanese bombers could attack the American vessels before the U.S. carriers even came within striking range. Ozawa planned to have the bombers attack the U.S. fleet, and then land on Guam to refuel before returning. Guam, he assumed, could provide support for his planes.

However, this attack was ineffectual for several reasons. First, the U.S. squadrons had already destroyed the airfield on Guam. Secondly, most of Japan's veteran pilots had been lost in the Solomon battles. Lastly, the U.S. fleet had set up a diversionary line of battleships in front of the large carriers. Some of the Japanese planes mistook the large battleships for carriers and were promptly gunned down.

The young Imperial rookies were no match for the American pilots. As the new radar systems on the American carriers spotted the assailants, every U.S. fighter was ordered into the air. The American veterans ripped through the Japanese formations, taking out wave after wave of young Japanese pilots. Some of the remaining Imperial pilots flew to Guam and tried to refuel. There, they were attacked by a carrier-based strike force. So many Japanese planes were lost that the Battle of the Philippine Sea became known as the Great Marianas Turkey Shoot. Of all the planes the Japanese launched that morning, only nine survived. The Allied damage was relatively slight: less than 25 planes were lost, and only one bomb inflicted minor damage on the *South Dakota*.

Still uninformed of the raids on the island landing strips, Ozawa despairingly decided to withdraw from the arena and rendezvous with tankers out at sea. Allied subs, however, slowed his retreat enough for the U.S. fleet to come into range. That afternoon, American reconnaissance aircraft caught up to the Japanese fleet.

Vice Admiral Marc Mitscher, who led 15 fast carriers, was bent on destroying what he thought to be carriers full of airplanes. He decided to launch a risky attack in the fading daylight after receiving word that Ozawa's fleet was 275 miles northwest. Over 200 fighters and bombers were launched before Mitscher found out that Ozawa was farther away than he had thought. Still, the planes reached the Japanese fleet, destroying the carrier *Hiyo* and two transports and damaging the *Zuikaku* and the *Chiyoda*. Mitscher's gamble was successful, although he had to turn on searchlights (dangerous in enemy waters) for his returning planes to land.

By now, the American forces had destroyed practically all of the airplanes in the Imperial Navy. Even though the Japanese still had carriers, they had no planes or pilots with which to equip them.

— ★ —

A Dauntless
dive bomber
peels out
of formation
during a
battle in the
Philippines.
(1944)

— ★ —



Leyte Gulf (October 1944)

Finally, the American military leaders began their invasion of the Philippines, which called for landings on the islands of Leyte and Luzon. MacArthur's troops waded ashore on Leyte in late October 1944. This distressed the Japanese, who realized that an American victory here would isolate its forces in the Philippines and cut off supply lines. Facing dimming hopes of victory, the Imperial Navy realized they must strike before the U.S. troop transports had a chance to land forces and supplies.

In preparation, the top Japanese admirals developed a plan, codenamed *Sho*. Under this strategy, a light carrier fleet (headed by Admiral Ozawa) would divert the American carrier force's attention away to the northeast. At the same time, two other fleets (without air support) would move into Leyte Gulf from the west. Admiral Kurita would head up the first strike fleet, later to be bolstered by the arrivals of Admiral Nishimura's and Admiral Shima's fleets. The Japanese drew these naval forces together and coordinated their movements with the land-based aircraft in the Philippines.

Between the Philippine and Leyte Gulf battles, Japan implemented a new strategy — suicide bombing attacks called "kamikaze" runs. Although it was common early in the war for crashing pilots to steer their planes toward an enemy ship, kamikaze attacks were not assigned as official missions until this time.

On October 18, Admiral Toyoda initiated *Sho*. He could not afford for the U.S. to take control of the island and its surrounding land masses. If this were to happen, the U.S. could easily conduct air strikes against the Japanese homeland.

Although the *Sho* strategy worked in part, things did not go as planned. Missing the diversionary fleet to the northeast, Admiral Halsey's group instead discovered Admiral Kurita's main strike group. Steaming southwest of Leyte, this attack fleet expected Halsey to chase the decoy group. Kurita also vainly depended on air cover from the Philippines. What he didn't know was that American planes had already knocked out the airfields in the Philippines.

As the battle unfolded, Halsey's group had the definite advantage. Swarming over the surprised Imperial fleet, American planes sank the battleship *Musashi*. Badly shaken, Kurita turned back to the west to wait for friendly air support.

After Kurita's retreat, Halsey's planes spotted the intended diversionary fleet headed by Ozawa less than 200 miles away. He mistakenly assumed that the fleet he had just faced was a diversion. Excitedly, Halsey pulled all of his ships out of the area and chased after Ozawa, leaving the forces under Rear-Admiral Thomas Kinkaid and Rear Admiral Thomas Sprague as the only defenses in the Leyte Gulf area. At this point, the American commanders Kinkaid and Sprague had no idea of Halsey's departure. This would prove unfortunate, especially for Sprague.

— ★ —

*A firing line
of U.S. vessels
bombards the
island of
Leyte, flanked
by landing
craft carrying
the first
of 100,000
troops.
(1944)*

— ★ —



The Japanese tactic, then, unintentionally worked in reverse: Halsey attacked the main fleet first, before being distracted by the decoy fleet to the northeast. Then, he pursued Ozawa and pulled out his ships, leaving the strait vulnerable to attack. That night and the next day, the two main Japanese strike forces moved into the San Bernadino and Surigao Straits and tangled with the U.S. fleets.

Kinkaid encountered one strike group in the Surigao Strait. The Imperial force, led by Admiral Nishimura, steamed into the strait, only to be headed off by Kinkaid's battleships and destroyers. Without air support from the Philippines, the Imperial vessels turned back under the heavy fire of the U.S. fleet.

Meanwhile, just south of the island of Samar, Sprague had several light escort carriers, but no battleships. He was outnumbered in ships and relied on torpedo planes and destroyers to guard the fleet when the Japanese attacked. The torpedo planes doggedly managed to steer the Imperial group away time and time again with real and dummy torpedo runs. They even turned back the mighty battleship *Yamato*. As Sprague's fleet dodged fire and radioed for support, the Japanese finally managed to sink three destroyers and a carrier. Then, Kurita's entire force unexpectedly withdrew from battle and headed back through the San Bernadino Strait. This sudden departure came as a surprise to Sprague, who minutes before had watched two U.S. carriers being heavily bombarded.

As the Imperial fleets moved through the straits, Halsey was busy attacking the diversionary fleet to the northwest. Halsey's planes found Ozawa's diversionary fleet and proceeded to attack the Japanese ships mercilessly, sinking the seaplane carrier *Chitose*, the carriers *Zuikaku* and *Zuiho* and severely damaging the carrier *Chiyoda*. Although delivering great damage to the Japanese, this battle was rather pointless since Ozawa's carriers had few planes.

During the few days of battle in the Leyte Gulf area, the Japanese lost four carriers, three battleships, six cruisers, 14 destroyers, hundreds of planes, and most of their trained pilots. The Imperial Navy was now truly devastated, allowing the U.S. to move toward the islands of Iwo Jima and Okinawa.

Iwo Jima and Okinawa:

Desperate Times (January - June 1945)

The airstrips acquired during the Battle of Leyte Gulf provided a vital base for Allied forces in the Philippines and brought the Japanese homeland within the range of the B-29 bomber. With the loss of Leyte, Japan's depleted Navy forces grew increasingly desperate in their attempts to drive out the U.S. forces.

In January 1945, a fleet of American ships prepared to sail a week-long journey from Leyte Gulf to Luzon. As soon as they reached Lingayen Gulf, the desperation of the Imperial forces culminated in mass kamikaze attacks. For six days, the U.S. fleet was continuously pounded by suicide planes.

When the American fleet reached Luzon, it took half a month for the Allied forces to invade the island and establish a foothold. In spite of incessant suicide attacks, the Americans managed to knock out the Japanese air bases. With the air attacks squelched, the Allied forces could occupy the island and move toward the Filipino capital of Manila. A month later, American Naval forces pushed their way into the city after days of savage street fighting. Manila was liberated from Japanese rule in February 1945, but MacArthur did not declare it secured until July of that year.

While MacArthur was attempting to flush out the last pockets of resistance in the Philippines, Admiral Nimitz was boldly advancing on Japan itself. For two months, land-based bombers from Saipan (along with some naval ships) had been bombarding Iwo Jima. On February 19, 1945, Nimitz stepped up the air attacks. By securing this tiny atoll, he hoped to provide a base for American escort fighter aircraft and a landing site for B-29s on their way back from bombing Japan.

The Japanese were fully aware of the immense peril their home country was in and defended the island ferociously. The Imperial soldiers were well entrenched, hiding in miles of underground trenches and defending the island with over 200 gun emplacements. Japanese installations on the island became regular targets during daily bombing raids. The ground troops were virtually unaffected, however, and had turned the obscure island into an isolated fortress.



— ★ —
Determined divisions of F6F Hellcats fly close to the ground as they unleash their bombs in support of the forces on Iwo Jima. (1945)
 — ★ —

Iwo Jima (January - February 1945)

In mid-February, after 72 days of air attacks, American forces finally launched the invasion on Iwo Jima. With 2,500 casualties during the first day of the invasion, it turned into a bloody, month-long battle that was won literally foot by foot. The Japanese pinned the Marines on the beachhead during the landing and continued to attack the troops as they progressed by night. The Americans named one stubbornly defended Japanese line the "meat grinder" for its horrific number of casualties.

Finally, the U.S. Navy destroyed the Japanese bunkers with air attacks, allowing the Marines to progress and eventually raise the flag on Mount Surabachi. The Japanese retreated to the northern tip of the island, and control of Iwo Jima was finally within reach of the Americans.

Even as the battle for Iwo Jima took place, American military leaders developed Operation Iceberg, the plan to invade Okinawa. Located just off the coast of Japan in the Ryukyu island chain, this island was the final stepping stone to Japan.

Okinawa (March 1945)

Nimitz anticipated that the Japanese would concentrate all their air power on the island of Kyushu (the southernmost island of Japan) to stop the American assault. He also knew that fighting this close to the mainland would involve facing a formidable force of Japanese planes and troops. For this battle, Nimitz mustered the strongest military arm yet seen in the war. He sent over 300,000 troops — along with armadas of supply ships, tankers and warships — to the coast of Okinawa. Japan followed suit, fortifying Okinawa with troops and supplying all surrounding air stations with thousands of planes.

The Americans began their pre-invasion missions by conducting sea-to-ground strikes against mainland airstrips and other installations on March 16, 1945. A week-long bombardment led to the actual invasion, which occurred on Easter Sunday, 1945. The invasion force teemed with 430 landing craft and assault ships, dozens of carriers and battleships, and close to 200 destroyers. By the end of the first day, Marines had overrun two airstrips and landed over 60,000 American troops. Unfortunately, the first moves were deceptively unopposed.

The Imperial commander, Lt. General Mitsuru Ushijima, had been assured by Tokyo that mass kamikaze attacks would cripple the U.S. fleet. Still, he and his troops fortified the southern part of the island with intricate dugouts and man-made caves in preparation for a clash with the American forces. For three months, the opposing soldiers crawled across the island in bloody, step-by-step battles.

As the land battle progressed, the Imperial Navy desperately turned to suicide attacks of all kinds, including *Bakas* (manned bombs flown by kamikaze pilots), explosive-packed torpedo boats, and even a one-way mission by the mighty *Yamato* battleship. As the air became dotted with hundreds of kamikaze planes, U.S. sailors grew depressed. After years of fighting, they realized that Japan would fight to the last man. These unconventional tactics were a true measure of Japan's desperation.

When the *Yamato* set out on its suicide mission, it had only enough fuel for a one-way trip to Okinawa, where it planned to batter American ground troops with its powerful 18-inch guns. On the morning of April 7, 1945, the battleship was spotted by reconnaissance aircraft. At noon, 300 American carrier aircraft zeroed in for the kill, pounding the *Yamato* with torpedoes and bombs. A few hours later, she turned over and sank, drowning most of her 2,400-man crew.

Suicide Missions (April 1945)

Perhaps the worst obstacles for the U.S. were the “floating chrysanthemum” raids, or masses of kamikazes that descended on a single ship. This concentration of bombing power delivered far more devastation than a single plane. Trying to fend off the *Bakas*, the American fleets placed a protective picket line of destroyers out in front of the carriers. They were able to shoot down some of the planes, but not before dozens of ships suffered the consequences of the kamikazes.

In April alone, three attacks by groups of *Bakas* claimed two U.S. destroyers, two carriers and several escort vessels. Massive kamikaze operations continued through May, damaging the British carriers *Formidable* and *Victorious* and the American carriers *Bunker Hill*, *Enterprise* and *Randolph*. Several destroyers and escort vessels were also sunk.

Most kamikaze planes never even made it to their destination, being picked off by combat air patrol planes and anti-aircraft fire. The few that did manage to penetrate the American defenses wreaked havoc on U.S. vessels. From April 6 to June 22, over 3,000 kamikaze planes sunk 36 ships and damaged 400 more. Slowly but surely, however, the Japanese were running out of aircraft.

The more imminent defeat became, the more bizarre the suicide tactics. Six weeks later, the U.S. Navy was still sustaining suicide attacks of all types — explosive-laden torpedo boats and bomber-borne guerrilla attacks. In the last method, bombers full of Japanese guerrilla soldiers would land on the U.S.-held airfields. Then, the men would jump out and begin firing at everything in sight.



— ★ —
 This kamikaze
 Zero screams
 toward the
 port side of a
 U.S. vessel as
 helpless
 gunnery teams
 duck behind
 blast shields
 in preparation
 for the crash.
 (1945)

— ★ —

The Navy and Marine forces survived despite the desperate methods employed by the Japanese. When June arrived, the American land forces had finally moved inland and conquered all but the southern tip of Okinawa. Once again, the Navy sent planes in to destroy the bunkers.

By June 21, 1945, Okinawa was securely in American hands, but the casualties were staggering. Over 5,000 Americans were dead. Thirty-eight Allied ships and almost 800 aircraft had been lost to the Japanese defense. The Japanese had lost even more — the island of Okinawa, 11,000 men and almost 8,000 aircraft. With the conquests of Iwo Jima and Okinawa, the Americans had secured the gateways to Japan itself. And still, the Japanese fought on ...

— ★ —
*Baka manned
 bombs were
 a measure
 of Japan's
 desperation
 late in the
 Pacific War.
 (1945)*



Bombing Japan (October 1944 - August 1945)

American military leaders were well aware that a ground invasion of Japan would cost an unacceptably high number of American lives. Instead, they decided to break their enemy's will through massive B-29 bombing missions on Japanese cities. The new Boeing B-29 *Superfortress* bomber was bigger and faster than any bomber previously developed. She was capable of flying over 6,000 miles with eleven crew members and ten tons of bombs, making the strategic bombing of Japanese military and industrial installations possible.

B-29 squadrons were first deployed at Chengtu, China, and flew several missions on southern Japan. These sorties, however, only met with limited success since most bombs missed their targets. In addition, fuel for the bombers had to be flown in over the Himalayas. The planes were also hampered by considerable mechanical problems.

When the first airstrip was completed in the Marianas, the B-29 bombers were transferred there. The first missions from the Marianas base were hardly auspicious. Most planes still missed their targets. On November 24, 1944, a formation of B-29 bombers was headed to the outskirts of Tokyo to bomb the Nakajima plant when they flew into the jet stream, an extremely strong high-altitude wind. The formations were blown apart and the bombs did only minimal damage.

When General Curtis LeMay was given command of the Marianas bombing program, he decided to take a different course. Instead of counting on precision

bombing, he loaded the B-29s with M69 incendiary bombs, capable of igniting the largely wooden buildings in Japanese cities. On the night of March 9, B-29s dropped incendiaries on Tokyo for several hours, leaving large parts of the city engulfed in flames. Over 100,000 people died that night.

American bombers hit Nagoya on the night of March 11, 1945. Osaka and Kobe were destroyed during the next few nights. In April, B-29s bombed Tokyo, Kawasaki and Yokohama. The Japanese sought to salvage some of their industrial capability by dispersing all industrial activity to underground locations or smaller towns. During May and June 1945, B-29s roamed across Japan, destroying smaller towns and hitting big cities with secondary raids.

When the invasion of Okinawa could not be halted even through massive kamikaze attacks, the Japanese realized the end was drawing near. Many preferred to fight to the death rather than to surrender. Civilians were armed with bamboo spears and assembled into a national guard. Most important government positions were still held by militants who refused to even discuss surrender to the Americans.

After the successful test detonation of the first atomic bomb in New Mexico in July 1945, President Harry Truman called for the Japanese to surrender unconditionally. The warning was ignored by the factious Japanese government. On August 6, 1945, an American B-29 bomber dropped the first atomic bomb on Hiroshima, leaving over 100,000 people dead. At least double that number would die later from radiation exposure and burns. The second atomic bomb later hit the city of Nagasaki, claiming equally horrendous casualties.

It was now obvious to even the most fanatical Japanese government officials that surrender was inevitable. On August 15, 1945, Emperor Hirohito addressed the country and announced the decision to surrender to the Allied forces. Two weeks after that, the American occupation forces began streaming into Japan. The Japanese government formally surrendered to the Allies aboard the USS *Missouri* on September 2, 1945. Almost four years after the attack on Pearl Harbor, the war had come to an end. The savage fighting across the Pacific was finally over.



— ★ —
Four members of the Japanese delegation solemnly wait to board a white Betty bearing green surrender crosses. (1945)
— ★ —



Timeline of Events

- | | |
|--|---|
| <p>12/41 Pearl Harbor
Attack on Guam
Japanese landing on Thailand</p> <p>2/42 Tarao</p> <p>4/42 Doolittle Raid
Bataan</p> <p>5/42 Battle of Coral Sea</p> <p>6/42 Midway Campaign</p> | <p>8/42 Guadalcanal Landing
Battle of the Eastern Solomons</p> <p>9/42 Bloody Ridge</p> <p>10/42 Cape Esperance
Battle of Santa Cruz</p> <p>11/42 Naval Battle of Guadalcanal
Yamamoto shot down</p> <p>4/43 Rabaul</p> <p>11/43 Tarawa</p> |
|--|---|

★ Historical battles included in *Pacific Strike*

★ Other historical battles

★ MIDWAY IS.

HAWAIIAN IS.

Pearl Harbor ★

2/44 Kwajalein
Eniwetok
Truk

6/44 Battle of the Philippine Sea

7/44 Guam and Tinian Landings

10/44 Battle of Leyte Gulf
Battle of the Sibuyan Sea
Battle off Samar Island

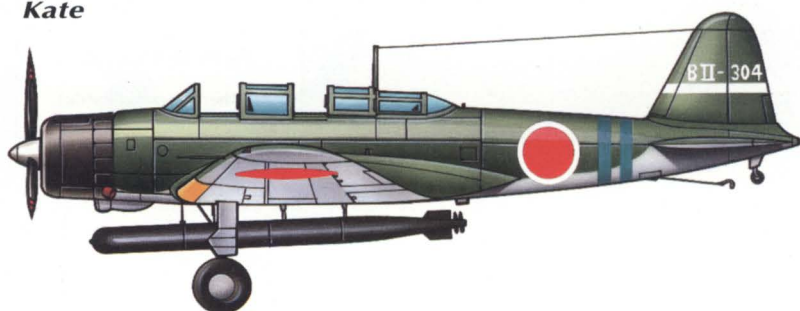
2/45 Iwo Jima

3/45 Okinawa

Incendiary raids on Tokyo,
Nagoya, Osaka and Kobe

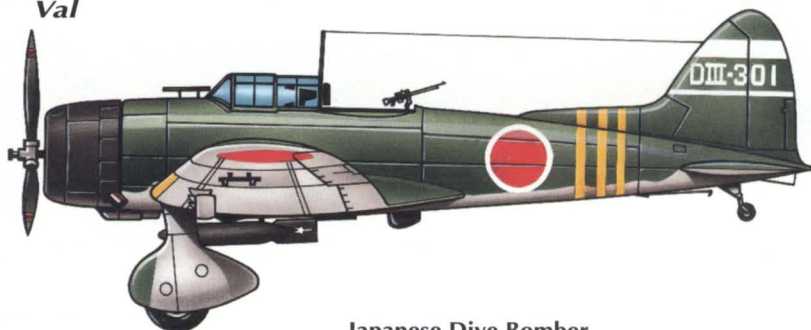
8/45 Atomic bombing of
Hiroshima and Nagasaki
Japan surrenders

● **Nakajima B5N2/B5N3**
Kate



Japanese Torpedo Bomber

● **Aichi D3A1**
Val



Japanese Dive Bomber

★ **Grumman F4F**
Wildcat



American Single-Seat Fighter

● Nakajima B5N2/B5N3 *Kate*

The Nakajima B5N carrier bomber made its first appearance during the Sino-Japanese war and played a vital role in the Pacific theater during World War II. By the time Japan surrendered, most pilots considered the *Kate* obsolete, but the B5N left its mark on the Allied forces. Over a hundred of these aircraft swarmed into Pearl Harbor in 1941 and sank numerous Allied ships.

Nakajima Aircraft Corporation adopted the *Kate*'s initial design after intensely studying the stressed-skin planes built by Northrop, Douglas and Clark. Japanese engineers incorporated a variable-pitch propeller and an integral wing fuel tank, along with hydraulic landing gear. The prototypes sported hydraulic folding wings, although they were later eliminated after extensive mechanical problems.

The *Kate* completed its first flight in January 1937, and Nakajima immediately put the bomber into mass production. Several months later, the company produced a second, torpedo-ready version. By the time Japan attacked Pearl Harbor, the B5N2 had partially replaced the original level bomber version. Later versions of the *Kate* were fitted with radar equipment and magnetic detectors.

For three years, the *Kate* remained a formidable torpedo bomber and matched the bombing capabilities of most Allied planes. The B5Ns participated in countless air and sea confrontations, injuring the carriers *Yorktown*, *Lexington*, *Wasp* and *Hornet*. Japan depended heavily on these planes in combat until 1943, when the Nakajima B6N (*Jill*) replaced the entire B5N series. The Imperial Navy continued to use the planes as pilot trainers and land-based bomber sub killers. No less than 1,149 B6N1s and B6N2s served on all Japanese fronts during the Pacific War.

Torpedo Bomber

Max. Speed.....	217 mph	Weight Empty	4,645 lbs.
Ceiling.....	5,000 ft.	Weight Loaded	8,407 lbs.
Range.....	1,237 mi.	Wingspan	50 ft. 11 in.
Climb Rate.....	1,378 ft./min.	Length	33 ft. 11 in.
Crew	Three	Height	12 ft. 2 in.

Engine.....1000-hp Nakajima NK1B Sakae 11, 14-cylinder radial
or (later) 1,115-hp Sakae 21

Origin.....Nakajima Hikoki KK, Aichi Tokei Denki, Dai-Juichi Kaigun Kokusho

Armament.....Two 7.7mm machine guns aimed from rear cockpit
Two 7.7mm machine guns above forward fuselage
Centerline rack for 1,764-lb. torpedo or three 551-lb. bombs

History.....1935 — Imperial Navy issues specifications
January 1937 — First flight occurs
1943 — B6N phases out the B5N

● Aichi D3A1 *Val*

The Aichi D3A1 was the first Japanese dive bomber to bear the distinguishing Rising Sun insignia, a symbol that would leave its mark on the Pacific for over four years. This carrier-based plane was also a vital participant in the surprise attack on Pearl Harbor in December 1941. *Val* squadrons flew most of the vital bombing missions during the early confrontations of the war.

The Imperial Navy first developed the specifications for the *Val* in 1936, when German scientists were secretly aiding Japan in developing new military technology. Two years later, Aichi Tokei Denki Airline Corporation tested the first D3A prototype, planning to replace the Navy's older D1A2 biplanes with the newer monoplanes. Similar to the *Zero*, this new aircraft was one of the last carrier planes to employ fixed landing gear. Its elliptical wings imitated those of the German Heinkel bombers, giving *Val* excellent dive bombing skills. Engineers also equipped *Val* with aerodynamic brakes and a glazed cockpit.

During prototype testing, problems arose concerning the power and stability of the plane during sharp turns. The Mitsubishi Kensei 43 engine did not provide enough power for good maneuverability, and the brakes proved inadequate. To solve the shortcomings in later versions, engineers chose the new 1,300-hp Kensei 54 engine and adjusted the brake mechanism. Once *Val* dropped its bombs, it could dogfight relatively well.

The initial D3A model first participated in combat in 1939. The D3A had a very successful first year, sinking more Allied battleships than any other Japanese plane — the *H.M.S. Hermes*, *Cornwall* and *Dorsetshire* in April alone. *Val* also participated at Midway and the Solomon Islands. Over 1,000 D3A-type planes were built during the war, although most were destroyed during Midway or sacrificed as kamikaze planes near the end of the war.

Dive Bomber

<i>Max. Speed</i>240 mph	<i>Weight Empty</i>5,309 lbs.
<i>Ceiling</i>30,050 ft.	<i>Weight Loaded</i>8,047 lbs.
<i>Range</i>915 mi.	<i>Wingspan</i>47 ft. 2 in.
<i>Climb Rate</i>1,950 ft./min.	<i>Length</i>33 ft. 5 1/2 in.
<i>Crew</i>Two	<i>Height</i>10 ft. 11 in.

Engine.....One 1,000-hp Mitsubishi Kensei 43 (or a 1,080-hp Kensei 44)
 Later versions had a 1,300-hp Kensei 54

OriginAichi Kokuki KK

ArmamentTwo 7.7mm machine guns mounted on wings
 7.7mm machine gun in rear cockpit
 Racks for 820 lbs. of bombs

History1939 — First flight occurs
 1944 — Fades from front lines, although some serve as suicide bombers

★ Grumman F4F *Wildcat*

The *Wildcat* fighter was one of the most widely deployed fighters in the Pacific theater of World War II. It was an extremely reliable and tough plane that boosted American performance in numerous battles across the Pacific.

Initially, Grumman designed the *Wildcat* as a biplane. After the Navy indicated that they favored the rivaling monoplane design of the *Brewster Buffalo*, the F4F was converted to a monoplane. By 1935 standards, the *Wildcat* performed admirably, demonstrating higher speeds than its biplane predecessors. Due to its numerous problems in the development process, however, the fighter wasn't used by the Navy until January 1941. With the furious pace of aviation development in the late 30s, the F4F had already become obsolete when the U.S. went to war with Japan.

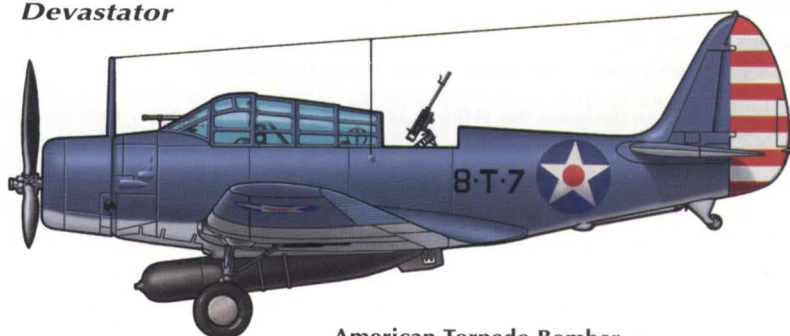
When the Navy finally agreed to the newest version of the F4F-3 in 1941, squadrons were stationed on the *Wasp* and *Ranger*. It soon became obvious that a folding wing system had to be developed for the *Wildcat* to reduce space requirements. The resulting F4F-4 slightly slower than the F4F-3 and over 700 pounds heavier when fully loaded. The plane carried less ammunition but was armed with one more .50-caliber gun on each wing. Finally, the engineers devised a new wing-folding mechanism that collapsed the wings parallel to the plane and reduced the wingspan (during storage) from 38 feet to 14 feet 4 inches.

In the Battle of the Coral Sea, *Wildcats* from the *Lexington* and the *Yorktown* managed to stave off the enemy *Zeros*, helping the U.S. win a tactical victory. After the Battle of Midway and the heated encounters at Guadalcanal and Leyte Gulf, the *Wildcats* were gradually phased out and replaced by *Hellcats* in mid-1943. Even though they participated in the Solomons and the invasion of North Africa, the F4F's days were rapidly drawing to a close. Modified versions were later stationed on escort carriers in the Pacific.

Single-Seat Fighter — F4F-3 (F4F-4)

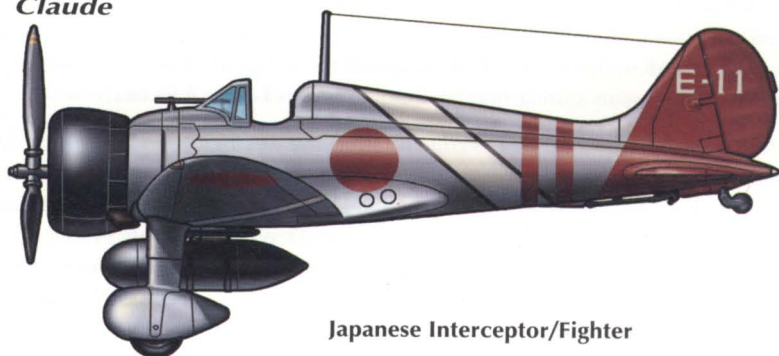
Max. Speed.....	320 mph (315 mph)	Weight Empty	4,520 lbs. (4,645 lbs.)
Ceiling.....	34,500 ft. (33,600 ft.)	Weight Loaded	5,870 lbs. (6,580 lbs.)
Range.....	830 mi. (810 mi.)	Wingspan	38 ft. 1 in.
Climb Rate.....	2,500 ft./min. (2,420 ft./min.)	Length	28 ft. 8 in.
		Height	11 ft. 10 in.
Crew	One		
Engine.....	1,200-hp Pratt & Whitney R-1830-76/86		
Origin	Grumman Aircraft Corporation		
Armament	F4F-3 — Four .50-caliber machine guns in outer wings		
	F4F-4 — Six .50-caliber machine guns in outer wings		
	Wing racks for two 250-lb. bombs		
History	February 1939 — First flight occurs		
	Mid-1943 — Makes last combat appearance		
	August 1945 — Final production delivery		

★ **Douglas TBD**
Devastator



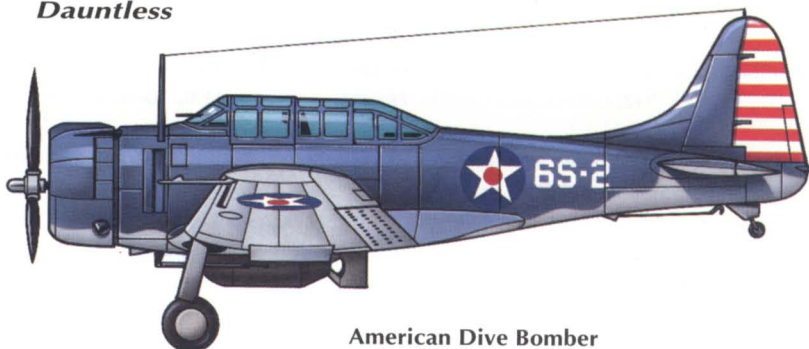
American Torpedo Bomber

● **Mitsubishi A5M4**
Claude



Japanese Interceptor/Fighter

★ **Douglas SBD**
Dauntless



American Dive Bomber

★ Douglas TBD *Devastator*

The Douglas TBD *Devastator* was the result of the Navy's search for a new torpedo and level bomber. The previously used biplanes (Great Lakes TG-2s and Martin BM-1s) were obsolete, and the new carriers *Ranger*, *Enterprise* and *Yorktown* needed bomber squadrons. The Douglas TBD was the first all-metal monoplane ordered by the U.S. Navy. It featured fully enclosed positions for the radio operator, the bombardier and the pilot, emphasizing the importance American aircraft placed on pilot survival.

Even though the *Devastator* was to go down in history as a failure, it was developed nearly two years earlier than most Japanese aircraft and lagged behind due to the incredible rate of aircraft research and development in the late 1930s. When Douglas first delivered 129 planes in June 1937, they were among the most modern aircraft in the Navy's inventory.

The *Devastator's* inadequate defensive armament soon proved lethal for the unwieldy bomber. Also, *Devastator* pilots had to fly at very low altitudes and slower than 100 mph during torpedo attacks, making them easy targets for the swift Japanese planes and anti-aircraft fire. The MK-13 torpedoes were extremely fragile and had to be dropped at low altitudes and speeds.

The TBD was deployed on the *Saratoga*, *Yorktown*, *Lexington*, *Enterprise* and some smaller carriers like the *Wasp* and *Ranger*. The revenge raids in the Gilbert and Marshall islands gave the first indication of the *Devastator's* fatal shortcomings. Even though the squadrons didn't suffer catastrophic losses during these raids, they failed to make any accurate hits. Disaster struck in the Battle of Midway, when three squadrons of *Devastators* were destroyed by Zeros and flak. Immediately after, the TBD *Devastator* was replaced by the *Avenger*, a more efficient and versatile bomber.

Torpedo Bomber

Max. Speed.....205 mph	Weight Empty7,190 lbs.
(125 with torpedo)	Weight Loaded10,200 lbs.
Ceiling.....19,600 ft.	Wingspan50 ft. 4 in.
Range.....450 mi.	Length36 ft.
Climb Rate.....900 ft./min.	Height15 ft. 4 in.
CrewTwo to three	
Engine.....850-hp Pratt & Whitney R-1830-64 Twin Wasp 14-Cylinder Radial	
OriginDouglas Aircraft Company	
ArmamentOne .30-caliber Colt-Browning machine gun on right side of nose	
.50-caliber machine gun in rear cockpit	
Single torpedo in belly	
Bomb racks for additional bomb loadout	
HistoryJanuary 1935 — First prototype flight occurs	
25 June 1937 — First production delivery	
4 June 1942 — Makes last combat appearance in Midway	

● Mitsubishi A5M4 *Claude*

The A5M4 was the Imperial Navy's first monoplane fighter and epitomized Japan's break from dependence on foreign engineering. Later, this aircraft matured into the highly acclaimed *Zero* series. Its designer, Jiro Horikoshi, started the monoplane project after the Imperial Navy demanded a small, fast, well-armed fighter plane.

Construction of the first A5M4 began in 1934 at the Mitsubishi Jukogyo KK airline corporation. Early versions of *Claude* (the Allied code name) had open cockpits and an inverted gull wing. Flush riveting and aluminum wing "skins" contributed to the sleek look of the maneuverable A5M4. The small cross-section of the airplane's frame reduced air resistance during flight, and the elliptical-shaped wings had split flaps that allowed tight turns during combat. The fixed landing gear eliminated linkage and weight from the plane, increasing the speed and maneuverability of the small fighter.

The first prototype exceeded expectations in February 1935, soaring up to 32,800 feet above sea level at speeds of 220 mph. Aerodynamic problems during dive bombing, however, forced Horikoshi to redesign the wing structures and power plants. In the actual production version, the inverted gull wing was abandoned and a 3-blade propeller was added. The final A5M4 sported modified power plants, a deeper fuselage and larger wheels. The aircraft was accepted in 1936 and continually updated until 1939.

Claudes first streaked through China's skies and destroyed 27 Chinese fighters over Chunking. When the U.S. finally entered the Pacific War, *Claudes* were still in use at outposts and on small carriers. Over 1,000 *Claudes* were assembled before the *Zero* stepped in as the successor. Most of the remaining A5M4s were converted into two-seater training planes for pilots who would later navigate the more sophisticated *Zeros*.

Interceptor/Fighter

Max. Speed.....	258 mph	Weight Empty	2,380 lbs.
Ceiling.....	32,700 ft.	Weight Loaded	3,575 lbs.
Range	445 mi.	Wingspan	35 ft. 4 in.
Climb Rate.....	2,180 ft./min.	Length	25 ft. 5 in.
Crew	One	Height	10 ft. 4 in.

Engine.....One 585-hp Nakajima Kotobuki nine-cylinder radial

Later versions had one 710-hp Nakajima Kotobuki 41

OriginMitsubishi Jukogyo KK

Also built by Dai-Nijuichi KK and KK Watanabe Tekkosho

ArmamentTwo 7.7mm machine guns

Racks for two 66-lb. bombs under wings

HistoryFebruary 1935 — First test flight

1936 — First production delivery

December 1939 — Navy receives final version delivery

★ Douglas SBD *Dauntless*

The SBD *Dauntless* design was derived from the Northrop BT-1. When Douglas Aircraft bought Northrop's California plant, the XBT-2 upgrade of the BT-1 also fell to them. Under Douglas, the XBT-2 became the XSBD-1, the first prototype of the *Dauntless*. Even though speed, range and payload were barely adequate, pilots loved their "Barges" because they were easy to fly.

Initial versions of the plane had serious handling and stability problems. Lacking armor and protected fuel tanks, they were quite dangerous to fly. The SBD's wings were strong and light but could not be folded and required more precious storage space onboard carriers. One drawback that plagued all the *Dauntlesses* was the lack of cockpit ventilation, causing canopies to fog up in the humid South Pacific.

Rejected by the Navy, the first SBDs were handed over to the Marines with severe stability problems. The SBD-3 was the first *Dauntless* suitable for close combat with the Japanese fighters, equipped with self-sealing fuel tanks, a bullet-proof windscreen and rugged armor. To offset the weight, engineers changed the aircraft's exterior to a lighter material (alclad) and removed the flotation equipment.

In the Battle of the Coral Sea, SBD-3 *Dauntlesses* from the *Yorktown* and the *Lexington* sank the *Shoho*, the first Japanese carrier lost in the Pacific theater. The SBD *Dauntlesses* had their greatest day at the Battle of Midway. They caught the Japanese by surprise with their carrier decks full of loaded aircraft. In a spirited attack, the *Dauntless* squadrons managed to take out three Japanese aircraft carriers, deciding the Battle of Midway in favor of the U.S. and turning the tide of the war in the Pacific. SBDs also played a vital part in the Solomons and Marianas campaigns. The SBDs fought their last battle as dive bombers in the Battle of the Philippine Sea before they were phased out in 1944 in favor of the *Helldiver*. Mexico used the planes until 1959.

Dive Bomber

Max. Speed.....	250 mph	Weight Empty	6,580 lbs.
Ceiling.....	24,200 ft.	Weight Loaded	10,500 lbs.
Range.....	462 mi.	Wingspan	41 ft. 5 in.
Climb Rate.....	1,485 ft./min.	Length	33 ft. 2 in.
Crew	Two	Height	12 ft. 10 in.

Engine.....One 1,200-hp Wright R-1820-60 Cyclone nine-cylinder radial

Origin.....Douglas Aircraft Company

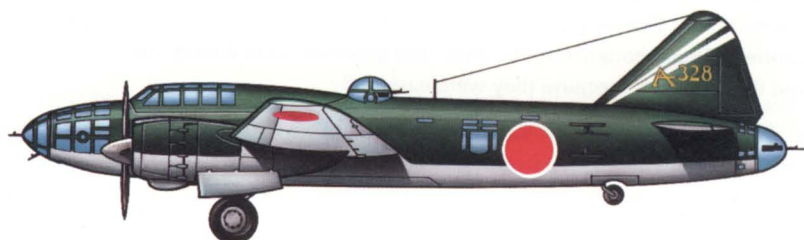
ArmamentTwo .50-caliber machine guns in nose
 .30-caliber machine gun in rear cockpit
 Two 100-lb. bombs or depth charges
 500-lb. or 1,000-lb. bombs

History.....July 1935 — First flight occurs (XBT-1)

 June 1940 — First production delivery (SBD-1)

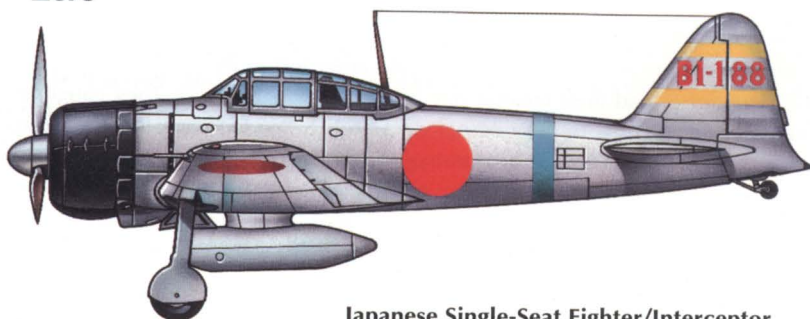
 July 1944 — Production ends

● **Mitsubishi G4M2**
Betty



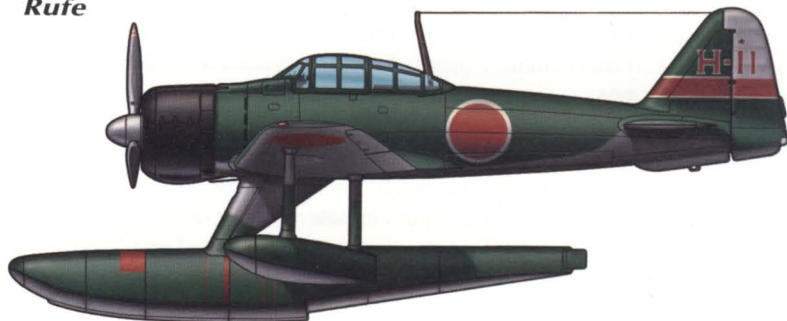
Japanese Torpedo Bomber/Missile Carrier

● **Mitsubishi A6M2 Rei-Sens**
Zero



Japanese Single-Seat Fighter/Interceptor

● **Mitsubishi A6M2-N Float Plane**
Rufe



Japanese Single-Seat Seaplane Fighter

● Mitsubishi G4M2 *Betty*

The infamous Mitsubishi G4M2 bomber, better known as the *Betty*, was first employed when Japan invaded China and flew missions until Japan surrendered on August 15, 1945. The Mitsubishi bomber was the result of the Navy's request for a land-based torpedo bomber capable of hauling torpedoes and bombs as far as 3,000 miles. Basing the airframe on the existing G3M bomber, Mitsubishi designer Kiro Honjo chose to equip the all-metal monoplane with retractable landing gear and to eliminate the protective armor. After the Navy rejected his suggestion of adding two more engines, he added an additional 1,000 gallons of fuel tanks onto the wing structures. Unfortunately, the tanks were not self-sealing and rapidly caught fire when struck by enemy fire or ground flak. This fault later earned the aircraft the nicknames "Flying Cigar" and "One-Shot Lighter."

Testing the new aircraft in China pilots found that the *Betty* measured up to all of the specification requirements, but had some inherent drawbacks. The weight of the plane impaired its defensive abilities, and the lack of armor resulted in many unnecessary crew casualties. Also, the *Betty's* 271-mph top speed would do little to defend it from the 370-mph *Hellcat* and the 425-mph *Corsair*.

One of the G4M2's great successes came early in the war when Japanese pilots sank the British battleships *Prince of Wales* and *Repulse* in December 1941. The *Betty's* final performance was not quite as successful — two white G4M2s solemnly carried the Japanese surrender team to Ie-Shima. As a final symbol of defeat, these two planes wore green surrender crosses instead of the usual Rising Sun.

Torpedo Bomber/Missile Carrier

Max. Speed.....	271 mph	Weight Empty	17,623 lbs.
Ceiling.....	29,800 ft.	Weight Loaded	27,550 lbs.
Range.....	2,982 mi.	Wingspan	81 ft. 9 in.
Climb Rate.....	1,380 ft./min.	Length	63 ft. 11 in.
Crew	Seven	Height	13 ft. 7 in.

EngineTwo 1,850-hp Mitsubishi MK4P Kasei 22 engines with methanol and water injection

Origin.....Mitsubishi Jukogyo KK

Armament.....20mm machine gun in tailgunner position
Three 7.7mm machine guns in nose, dorsal and ventral positions
Internal bomb load of 2,205 lbs.
or external load of 1,764 lbs. of torpedoes
Some models adapted to carry Ohka piloted missiles

History1938 — Imperial Navy issues specifications
October 1939 — First prototype flight occurs
April 1941 — First production delivery of the G4M2
November 1942 — G4M2 makes first combat flight

● Mitsubishi A6M Rei-Sens *Zero*, *Zeke* and *Zeke II*

Japan's decision to expand in the Pacific hinged on the seemingly invincible *Zero* fighter. In the ocean arena, the A6M2, A6M3 and A6M5 *Rei-Sens* flew against almost every fighter the Allies had to offer — the *Wildcat*, *Corsair* and *Hellcat*

The A6M, dubbed *Zero* and *Zeke* by the Allies, evolved from Mitsubishi's A5M *Claude* fighter. Both planes were among the first Japanese aircraft to abandon the popular biplane model in favor of a sleek, monoplane fighter. Jiro Horikoshi, the aeronautical engineer behind the *Zero* fighters, traded speed and range for low-wing maneuverability. He took advantage of new metallurgical technology and the novel procedure of flush riveting, employing every method available to streamline the wings and landing gear.

Subsequent versions of the *Zero*, except for the A6M2 Model 11, incorporated foldable wingtips to avoid damage during elevator transport. Another version, the A6M2-N, abandoned the traditional landing gear in lieu of a float apparatus. The A6M3 model traded in its 925-hp engine for a 1,130-hp Nakajima motor and adopted a clipped wing. Toward the end of the war many were converted into A6M7 suicide planes.

The Japanese first used the *Zero* to down Chinese pilots who dared to oppose this versatile aircraft. Later, the Allies experienced the destructive capabilities of this warplane during the attacks on Pearl Harbor. Japan mass-produced various models of the *Zero* until the Allies destroyed the Nakajima factory in 1944. After the early phenomenal successes of the plane, the Japanese believed that the A6M5 was invincible and did not fully research ways to produce a more efficient fighter plane. By 1944, the Allied forces had created the Grumman F6F *Hellcat*, which contested *Zero's* supremacy of the skies.

Single-Seat Fighter/Interceptor A6M3

Max. Speed.....	336 mph	Weight Loaded	5,828 lbs.
Ceiling.....	36,250 ft.	Wingspan	36 ft. 1 in.
Range	1,940 mi.	Length	29 ft. 11 in.
	(with drop tank)	Height	9 ft. 8 in.
Climb Rate.....	4,500 ft./min.	Crew	One (fighter) or
Weight Empty	3,984 lbs.		two (trainer)

Engine 1,130-hp Nakajima NK1C Sakae 21, 14-cylinder radial, air-cooled

Origin Mitsubishi Jukogyo KK

Armament Two 7.7mm machine guns mounted above front fuselage

Two 20mm cannon fixed on outer wings

Two 66-lb. bombs mounted on wing racks (132-lb. in A6M5)

History May 1937 — Imperial Navy issues specifications

April 1939 — First flight occurs (A6M2)

September 1940 — First combat test takes place over Chunking, China

April 1945 — Production discontinues

● Mitsubishi A6M2-N Float Plane *Rufe*

The evolution of the aircraft carrier allowed battles to be fought completely by carrier-launched fighters. Although carriers were potent weapons, neither side could afford to send them to every area of the Pacific. Both the Allies and Japan needed a versatile aircraft that could land without a carrier deck or a landing strip.

To remedy this situation, the Imperial Navy issued specifications calling for the A6M2-N *Rufe* floatplane fighter. This innovative aircraft was to provide air support during amphibious operations and to permanently guard island strongholds. Original *Zero* designer Jiro Horikoshi realized that with a few modifications, the A6M2 Model 11 could be converted into a seaplane.

Horikoshi eliminated the landing gear, tail wheel, and tail hook of the Model 11 *Zero*, and added a large float under the belly and two outrigger floats on struts. A small fin was added to the end of plane to increase stability. Finally, balance tabs were added to the ailerons, reducing the force required to steer the plane laterally.

The miracle plane was not without faults — the 950-hp engine fell short of the sturdy 1,000+ hp of the Allied planes. Also, armor plating for the pilot and fuel tanks were sacrificed to decrease the weight of the plane. One redeeming feature was its maneuverability. The first prototype rolled out of the hangar a year before Operation Hawaii was carried out at Pearl Harbor. The aircraft was formally accepted by the Imperial Navy in July 1942.

During the Aleutian Operation, the Allied forces constructed steel mesh runways along the sandy beaches. Unfortunately, the land-based Allied planes were often grounded after winds raged across the Bering Sea and destroyed the makeshift airstrips. The *Rufe* float planes, however, could fly and bomb without the use of runways. Soon, seaplane bases dotted the Pacific — the Aleutian Islands, the Solomon Islands and the Marshall Islands. Until production was halted in September 1943, the Japanese built 327 A6M2-N float planes.

Single-Seat Seaplane Fighter

<i>Max. Speed</i>	271 mph	<i>Weight Empty</i>	6,349 lbs.
<i>Ceiling</i>	32,810 ft.	<i>Weight Loaded</i>	6,613 lbs.
<i>Range</i>	1,107 mi.	<i>Wingspan</i>	29 ft. 4 1/2 in.
<i>Climb Rate</i>	2,430 ft./min.	<i>Length</i>	33 ft. 2 in.
<i>Crew</i>	One	<i>Height</i>	14 ft. 1 in.
Engine950-hp Nakajima NK1C Sakae 12, 14-cylinder radial, air-cooled			
OriginNakajima Hikoki KK aircraft company			
ArmamentTwo 20mm cannon fixed on outer wings			
Two 7.7mm machine guns mounted above front fuselage			
Wing racks for two 132-lb. bombs			
<i>History</i>December 1941 — First flight occurs			
September 1943 — Production halts			

★ **Grumman TBF-1**
Avenger



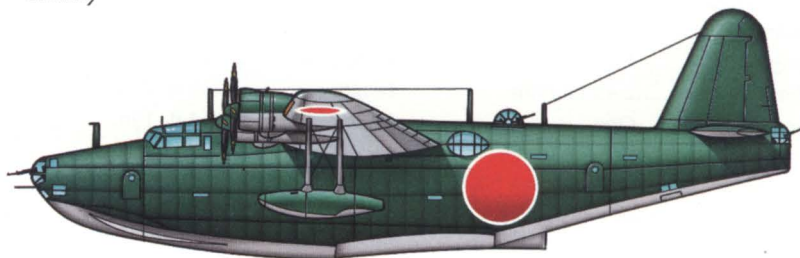
American Torpedo Bomber/Anti-Sub Warfare (ASW)/Airborne Early Warning (AEW)

★ **Grumman F6F-3 and F6F-5**
Hellcat



American Naval Fighter

● **Kawanishi H8K**
Emily



Japanese Long-Range Reconnaissance/
Flying Attack Boat

★ Grumman TBF-1 Avenger

The TBM/TBF-1 *Avenger* was originally developed to replace the TBD *Devastator*, which was almost obsolete at the outbreak of the war with Japan. The U.S. Navy wanted a torpedo bomber that would meet several requirements: a top speed close to 300 mph, a large internal bay for bombs or one torpedo, armor protection for the three crew members, and a dorsal gun turret. Grumman's design relied heavily on the F4F4 *Wildcat* model and would earn the TBF the nickname "Turkey."

The TBF-1 implemented the revolutionary amplidyne motor in its dorsal machine gun turret, allowing for greater maneuverability and range of motion. Later versions of the *Avenger*, carried .50-caliber machine guns on both wings. In November 1942, Eastern Aircraft Division of General Motors subcontracted from Grumman and continued to produce the *Avenger* under the name TBM-1.

The *Avenger* was a relatively slow and large airplane that did not demonstrate exceptional maneuverability. At the same time, it was extremely easy to fly and very resistant to damage. After the development of the "ring-tailed" torpedo the *Avenger* became one of the most formidable torpedo bombers ever. It was also well suited as a level bomber, as it could drop bombs with great accuracy. The TBF could even be used as an adequate dive bomber, using its extended landing gear as brakes.

The *Avenger* was officially delivered to the Navy on January 30th, 1942 and they were immediately taken to Midway and ordered to attack the Japanese fleet. Five out of the six planes were shot down by intercepting *Zero* fighters. In subsequent confrontations, however, the *Avengers* held their ground. They were instrumental in blocking the "Tokyo Express," a nightly traffic of Japanese destroyers between Rabaul and Guadalcanal and also played a vital part in the Eastern Solomons.

Torpedo Bomber/Anti-Sub Warfare (ASW)/Airborne Early Warning (AEW)

Max. Speed.....	275 mph	Weight Empty	10,100 lbs.
Ceiling.....	23,200 ft.	Weight Loaded	15,900 lbs.
Range	1,200 mi.	Wingspan	54 ft. 3 in.
Climb Rate.....	1,069 ft./min.	Length	40 ft. 1 in.
Crew	Three	Height	16 ft. 2 in.
Engine.....	One 1,700-hp R-2600-8 or -20 Double Cyclone 14-cylinder two-row radial		
Origin	Grumman Aircraft Engineering Corporation, also built by Eastern Aircraft		
Armament	One .30-caliber gun in upper fuselage .50-caliber gun in dorsal power turret, later also in outer wings .30-caliber machine gun in rear ventral position Internal bay for one torpedo or 2,000 lbs. of bombs, later wing racks for eight 60-lb. rockets		
History	August 1941 — First flight occurs (XTBF-1) August 1954 — First production delivery		

★ Grumman F6F-3 and F6F-5 *Hellcat*

When the *Wildcat* was finally introduced in 1941, its design was already more than five years old. Grumman immediately began working on improved versions. However, the Navy soon realized that additional changes would improve the aircraft only marginally. In addition, the Americans were beginning to hear tales of the fabled Japanese *Zero*, a plane that supposedly eclipsed every other aircraft in the sky. Both developments galvanized the Navy into action. They ordered a complete redesign of the *Wildcat* with better maneuverability, more protective armor and ammunition, and greater range and speed.

The *Hellcat* prototype developed by Grumman had a considerably larger wingspan and lower wings. The new F6F was very stable and easy to fly and a more powerful engine solved initial speed and climb rate problems.

In January 1943, a squadron of *Hellcats* was issued to the *Essex*. Shortly after that, F6F-3s saw their first action when they escorted *Dauntlesses* in the Marcus raids. The new fighter could stay with *Zeros* during most maneuvers, and was considerably sturdier and safer than the *Zero*.

The fighter played a vital role in the Marianas campaign. In the Battle of the Philippine Sea, Japanese carrier aviation was destroyed when the Japanese lost over 200 airplanes. The Americans, on the other hand, lost only 22 *Hellcats*. As a rule, these planes boasted better victory ratios than most other fighters: for every F6F that was shot down, 20 Japanese planes were destroyed. The *Hellcat* was phased out in 1945 in favor of the *Corsair*.

Naval Fighter — F6F-3 (F6F-5)

<i>Max. Speed</i>	370 mph (385 mph)	<i>Weight Empty</i>	9,035 lbs. (9,055 lbs.)
<i>Ceiling</i>	37,900 ft. (37,600 ft.)	<i>Weight Loaded</i>	13,226 lbs.
<i>Range</i>	1,070 mi. (1,100 mi.)		(12,600 lbs.)
<i>Climb Rate</i>	3,220 ft./min.	<i>Wingspan</i>	42 ft. 8 in.
	(3,270 ft./min.)	<i>Length</i>	33 ft. 6 in.
<i>Crew</i>	One	<i>Height</i>	13 ft. 0 in.
<i>Engine</i>	One 2,000-hp Pratt & Whitney R-2800-10 Double Wasp 18-cylinder two-row radial		
<i>Origin</i>	Grumman Aircraft Engineering Corporation		
<i>Armament</i>	F6F-3 — Six .50-caliber Browning machine guns in outer wings F6F-5 — Six .50-caliber Browning machine guns in outer wings or four .50-caliber Browning machine guns and two 20mm cannon Six 5-inch air-to-ground rockets		
<i>History</i>	June 1942 — First prototype flight occurs January 1943 — First production delivery November 1945 — Final production delivery		

● Kawanishi H8K *Emily*

Early on in the Pacific War, the Imperial Navy used the Kawanishi H6K flying boat to conduct reconnaissance missions. Although the existing aircraft performed adequately, the Navy wanted to triple the speed of the plane while doubling its range.

In 1938, the Japanese Navy developed and issued the specifications for a refined surveillance/attack plane. For two years, Dr. Kikuhara of Kawanishi Airplane Corporation worked diligently to meet these rigorous standards. The result was the *Emily*, Japan's largest and finest seaplane.

Kawanishi unveiled the first prototype in January 1941, only to discover that the whale-shaped body and weight of the plane caused disastrous problems during flight. This plane was put into production in 1941, but engineers later redesigned the fuselage and flap configuration to increase stability. The revised model came off the production lines in 1943 and was immediately deployed to the Pacific battlefield. Subsequent versions of this plane were outfitted with retractable stabilizing floats and radar equipment.

Kawanishi's new float plane gained the respect of Allied pilots due to its formidable weaponry — five 20mm cannon, three 7.7mm machine guns, and over 4,000 pounds of torpedoes or bombs. Not only did the *Emily* possess considerable firepower; it also had armor plating to protect its crew. With a range close to 4,500 miles, the H8K2 was used for flying 24-hour reconnaissance missions against the U.S. fleets. During the last two years of the war, the *Emily* stood out as the most advanced float plane of any armed force.

Long-Range Reconnaissance/Flying Attack Boat

Max. Speed.....	290 mph	Weight Empty	40,500 lbs.
Ceiling.....	28,740 ft.	Weight Loaded	71,650 lbs.
Range.....	4,460 mi.	Wingspan	124 ft. 8 in.
Climb Rate.....	1,575 ft./min.	Length	92 ft. 4 in.
Crew	Ten	Height	30 ft.

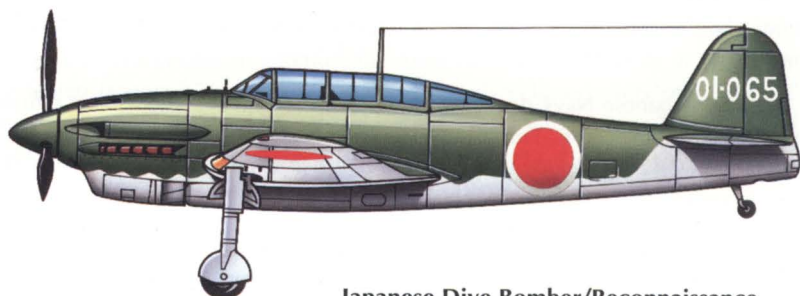
Engine.....Four 1,850-hp Mitsubishi Mk4Q Kasei 22, 14-cylinder radial, air-cooled

Origin.....Kawanishi Konuki KK

Armament.....Five 20mm cannon in the nose, dorsal and tail positions
Three 7.7mm machine guns in the beam and rear windows
4,408 lbs. of either torpedoes or bombs

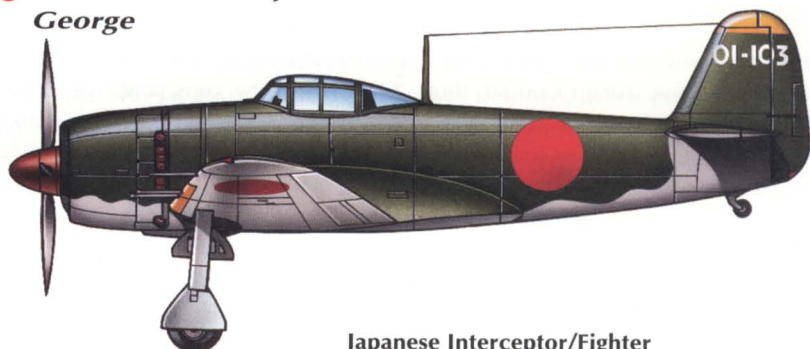
History.....Summer 1938 — Imperial Navy issues specifications
January 1941 — Kawanishi tests H8K1 prototype
August 1941 — Production of H8K1 begins
1943 — Production of H8K2 begins

● **Yokosuka D4Y Suisei**
Judy



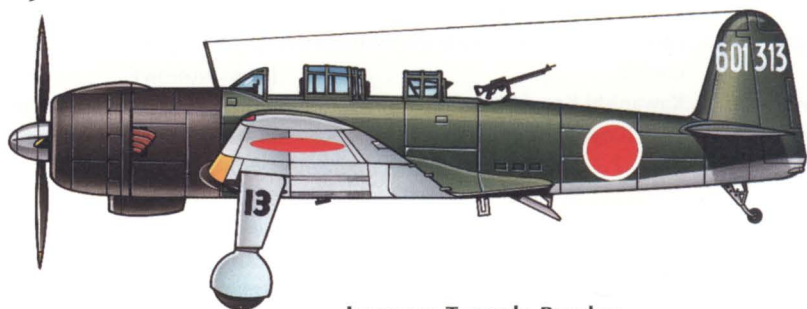
Japanese Dive Bomber/Reconnaissance

● **Kawanishi N1K2-J Shiden Kai**
George



Japanese Interceptor/Fighter

● **Nakajima B6N Tenzan**
Jill



Japanese Torpedo Bomber

● Yokosuka D4Y Suisei *Judy*

As its Japanese name indicates, the *Suisei* was designed as a “flying comet” dive bomber in the early part of the Pacific War. The Imperial Navy demanded a fighter with the prowess of the *Zero* and issued a set of rigid specifications in 1937. Simultaneously developed by Dai-Ichi Kaigun Koku Gijitsusho and Yokosuka, the plane’s original prototype was based on the German Heinkel bombers.

The D4Y, known to the Allies as *Judy*, was one of two Japanese combat planes equipped with a liquid-cooled, in-line engine that theoretically had less drag than traditional types. However, early prototype testing of the otherwise technically sound plane unveiled piloting difficulties attributed to the engine. Engineers finally switched to the traditional radial engine and added 20mm cannon to the fuselage. The new engine increased the reliability of the *Judy*, solving many of the problems encountered during dive bombing.

The most praised aspect of this plane was its 978-mile range, ideal for conducting long-range reconnaissance missions. In fact, the *Judy* was first used as a reconnaissance aircraft during its debut mission in Midway on the carrier *Soryu*. The ship was promptly sunk during the first encounter with the Allies, and other planes of this type were handed over to less experienced crews. Subsequent missions found the *Judy* acting as an attack plane in the Marianas, where the aircraft fell victim to *Hellcats* during the Allied “Turkey Shoot.” Later, the *Suisei* served as a piloted bomb capable of carrying 1,764 pounds of explosives. The last kamikaze attack of the war was a *Judy* that slammed into an Allied battleship at Okinawa. All in all, over 2,000 D4Y series planes participated in the war between 1941 and 1945.

Dive Bomber/Reconnaissance

Max. Speed.....	342 mph	Weight Empty	5,650 lbs.
Ceiling.....	32,565 ft.	Weight Loaded	9,615 lbs.
Range.....	978 mi.	Wingspan	37 ft. 9 in.
Climb Rate.....	1,970 ft./min.	Length	33 ft. 7 in.
Crew	Two	Height	12 ft. 1 in.
Engine.....	1,200-hp Aichi AE1A Atsuta, 12-cylinder V, liquid-cooled		
Origin	Dai-Ichi Kaigun Koku Gijitsusho and Yokosuka (prototypes) and Aichi Kokuki KK and Dai-Juichi Kaigun Kokusho (mass production)		
Armament	Two 7.7mm machine guns fixed above the engine 7.7mm machine gun mounted on rear cockpit 20mm cannon in the fuselage Internal bomb bay for single 551-lb. bomb Wingracks for two 66-lb. bombs		
History	November 1940 — First flight occurs 1941 — First production delivery 1945 — <i>Judy</i> is the last kamikaze plane to attack Allied forces		

● Kawanishi N1K2-J Shiden Kai *George*

To maintain air superiority in the isolated Pacific islands, Japan created the N1K1-J, a seaplane fighter designed specifically to defend island bases. When it became imperative to create new aircraft to oppose the Allied advances, its superior design inspired Kawanishi Airplane Corporation to create a modified land-based model. Eventually, two versions of the *Shiden Kai* ("violet lightning") served as land-based fighters and kamikaze bombs.

Designs for the N1K2 -J began in late 1941. Although the Imperial Navy had not authorized development of a new attack plane, Kawanishi corporation foresaw the need for a better fighter and constructed five prototypes under the direction of Dr. Kikuhara. The plane retained most of the physical characteristics of the float plane, including the mid-wing design and large propeller. These two features caused instability in the retractable landing gear and noticeably reduced the forward visibility of the pilot. Later modifications somewhat offset these drawbacks.

Most pilots later agreed that the *George* was one of the most maneuverable fighters yet developed, rivaling the F6F2 *Hellcat* and the F4U *Corsair*. Its versatility improved even more once engineers redesigned the fuselage and tail fins and adopted a low-wing configuration. The improved N1K2-J had a 3-blade propeller, as well as fewer parts and greater firepower.

After the Imperial Navy accepted the prototype, they planned to mass-produce the fighter at four different Navy arsenals and four private manufacturers. Heavy bombing by American forces halted this initiative, but not before 415 of the planes had been built. Most of them were sacrificed as suicide planes in Okinawa.

Interceptor/Fighter

<i>Max. Speed</i>369 mph	<i>Weight Empty</i>5,858 lbs.
<i>Ceiling</i>35,300 ft.	<i>Weight Loaded</i>8,820 lbs.
<i>Range</i>1,293 mi.	<i>Wingspan</i>36 ft. 4 in.
<i>Climb Rate</i>3,300 ft./min.	<i>Length</i>30 ft. 8 in.
<i>Crew</i>One	<i>Height</i>13 ft. 0 in.

Engine.....1,825-hp Nakajima NK9H Homare 21, 18-cylinder, air-cooled radial

OriginKawanishi Kokuki KK

ArmamentFour 20mm cannon mounted on wings

Two 7.7mm machine guns in the fuselage

551 lbs. of bombs

HistoryDecember 1941 — First version (N1K1-J) undergoes testing

Early 1943 — Navy officially accepts N1K1 and puts it into production

December 1943 — Second version prototype (N1K2-J) takes flight

June 1944 — Mass production of N1K2 begins

● Nakajima B6N Tenzan *Jill*

Although the B5N *Kate* was initially the most popular Japanese bomber, it was eventually surpassed by the B6N *Tenzan*, codenamed *Jill*. The Imperial Navy began searching for a replacement after the B5N2s became obsolescent. Nearly two years later in 1943, the first *Jills* rolled off the production line.

Kenichi Matsamura, the Nakajima engineer that developed the bomber, was inspired by the success of the B5N airframe. Using it as a template, he added a vertical tail to decrease the amount of space necessary to transport the plane on aircraft carriers. Against the Navy's recommendation, Matsamura chose to implement Nakajima's new Mamoru engine.

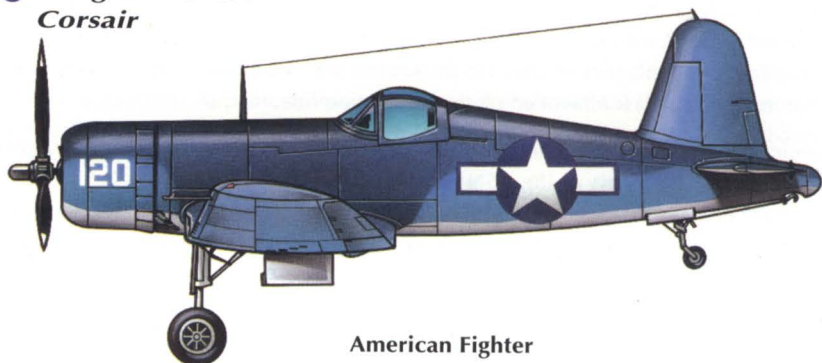
Initial prototypes of the *Tenzan* ("Mountain of the Sky") proved successful, although engineers later converted the engine to the sturdier Mitsubishi Kasei 25 and added heavier armament and radar. As one last change, the propeller was switched to a smaller model in order to increase the plane's stability. Aside from these three changes, *Jill* was one of the few Japanese planes whose design remained basically unchanged throughout its lifetime.

Relegated to large carriers because of its high landing speed and wing load, the final production version of the *Jill* made its debut combat flight in the Marshall islands in June 1944. In spite of its superior design, the new bomber proved ineffective because of Japan's lack of trained pilots and the advent of the Allied *Hellcat*. In fact, *Hellcats* destroyed almost all of the *Tenzans* during the Marianas campaign. The B6N faded out of battle in June 1945 after the torpedo and suicide attacks at Okinawa.

Torpedo Bomber

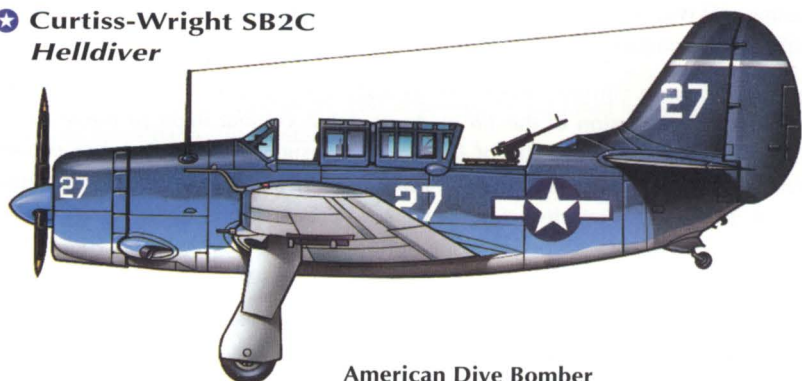
Max. Speed.....	299 mph	Weight Empty	6,636 lbs.
Ceiling.....	28,379 ft.	Weight Loaded	11,464 lbs.
Range.....	1084 mi.	Wingspan	48 ft. 10 in.
Climb Rate.....	1,720 ft./min.	Length	35 ft. 7 in.
Crew	Three	Height	12 ft. 5 in.
Engine.....	1,870-hp Nakajima Mamori 11, 14-cylinder, two-row radial. B6N2 had same layout, but a 1,850-hp Mitsubishi Kasei 25		
Origin	Nakajima Hikoki KK		
Armament	Two 7.7mm machine guns — one on rear cockpit, the other on the rear ventral (B6N2) 7.7mm mounted on left wing 1,764-lb. torpedo (offset to right) or six 220-lb. bombs under fuselage		
History	Late 1942 — Engineers test final prototype 1943 — First production run begins (suspended after 135 were built) June 1943 — Production of B6N2 resumes June 1945 — B6N2 falls out of combat action		

★ **Vought F4U-1A**
Corsair



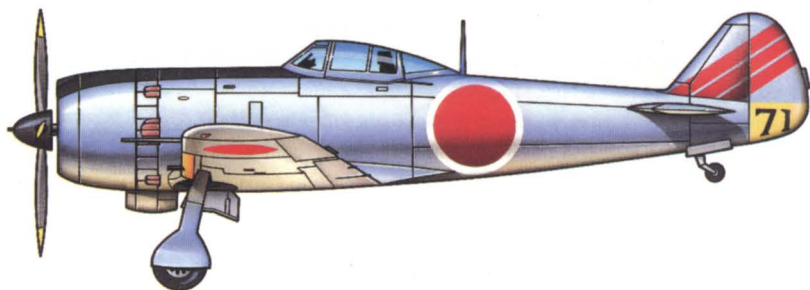
American Fighter

★ **Curtiss-Wright SB2C**
Helldiver



American Dive Bomber

● **Nakajima KI84 Hayate**
Frank



Japanese Interceptor/Fighter/Bomber

★ Vought F4U-1A *Corsair*

The F4U-1 *Corsair* was the result of the Navy's desire for a new high-speed, high-altitude fighter. The Navy wanted an aircraft that would demonstrate speeds well over 350 mph at altitudes of over 20,000 feet. Good handling at slow speeds was also important to guarantee relative safety with carrier landings.

After a prolonged period of research and development, the *Corsair* was outfitted with a powerful engine and the biggest propeller ever used on a fighter aircraft. This new propeller caused major design problems, necessitating a relocation of the cockpit to the aft and earning the *Corsair* its affectionate nickname "Hognose." However, it allowed the *Corsair* to achieve an unprecedented speed of 425 mph.

The F4U was hard to handle at slow speeds and had limited cockpit vision. The fighter also was notoriously difficult to recover from a stall. These drawbacks made it difficult to use as a carrier-based fighter, although the famous "Jolly Rogers" unit landed on ships for some time before it was officially approved as a carrier plane in December 1944. Before that, it served as a land-based fighter for the Marines.

In spite of its faults, the *Corsair* was the best fighter in the world. With its uncontested speed, it could outrun any risky situation. It could easily use its altitude advantage to dive at the enemy from above, inflicting great damage with its six machine guns and escaping at great speeds. The Japanese dubbed it "Whistling Death," referring to the tremendous toll the fighter took on enemy aircraft.

In a flight over Iwo Jima, Charles Lindbergh personally approved the F4U-1. The *Corsair* was later employed as a fighter bomber and a night fighter and was also widely used in the Korean War. When production was discontinued in 1952, over 12,000 *Corsairs* had been built, making it the U.S. fighter with the longest production run prior to the *Phantom*.

Fighter

Max. Speed.....	425 mph	Weight Empty	8,870 lbs.
Ceiling.....	36,000 ft.	Weight Loaded	13,990 lbs.
Range	1,350 mi.	Wingspan	41 ft. 0 in.
Climb Rate.....	2,920 ft./min.	Length	32 ft. 9 in.
Crew	One	Height	14 ft. 8 in.
Engine.....	2,250-hp Pratt & Whitney R-2800-8 Double Wasp 18-cylinder radial engine		
Origin	Chance Vought (United Aircraft Corporation),		
Armament	Six .50-caliber Browning MG 53-2 machine guns		
	Two 1,000-lb. bombs		
	Eight HVAR (rockets)		
History	29 May 1940 — First flight occurs (XF4U)		
	June 1942 — Production begins		
	December 1952 — Production ends		

★ Curtiss-Wright SB2C *Helldiver*

Even though the SBD *Dauntless* was one of the most popular combat aircraft ever flown, the U.S. Navy was well aware of its shortcomings and was looking for alternatives. The SB2C *Helldiver* was designed to replace the SBD with superior range abilities. Later, the Army adopted a similar dive bomber version called a *Shrike*.

The *Helldiver* had to contend with numerous problems during its protracted development phase. Increased wing size and enlarged internal volume meant that the *Helldiver* was much heavier than the SBD. The Navy also required that two SB2Cs fit on one carrier elevator, thus limiting the length of the bomber. Increasing the volume without increasing the length of the new aircraft resulted in severe stability problems. The only feasible solution was enlarging the tail, which eventually earned the *Helldiver* the nickname "big-tailed beast." The prototype demonstrated poor maneuverability and unresponsive controls, making it extremely unpopular with most *Dauntless* pilots.

Testing began in February 1940. One of the first prototypes crashed, interrupting further development for six months. After a series of modifications, the *Helldiver* was finally delivered in 1942. Even though the SB2C was originally intended for the *Essex* and the *Lexington*, the carriers had to leave for the front before the bomber was completed. By the time a mature *Helldiver* version was delivered to the front, the importance of dive bombers in combat was already declining. Fighter-bombers like the *Corsair* could drop their loads and still fight effectively. The U.S. continued to utilize *Helldivers* until they were phased out by *Skyraiders* in 1949.

Dive Bomber

Max. Speed.....	275 mph	Weight Empty	10,890 lbs.
Ceiling.....	24,400 ft.	Weight Loaded	16,597 lbs.
Range.....	1,050 mi.	Wingspan	49 ft. 8 in.
Climb Rate.....	1,600 ft./min.	Length	36 ft. 6 in.
Crew	Two	Height	16 ft. 7 in.

Engine.....	1,700-hp Wright R-2600-8 Cyclone 14-cylinder two-row radial
Origin	Curtiss-Wright Corporation, Fairchild and Canadian Car & Foundry
Armament	Two 20mm cannon or four .50-caliber guns in wings
	Two .30-caliber or one .50-caliber gun in rear cockpit
	Provision for 1,000-lb. (454 kg) bomb load internally
	Later added wing racks
History	December 1940 — First prototype flight occurs
	June 1942 — First production delivery
	November 1943 — First action takes place over Rabaul
	1945 — Production stops

● Nakajima KI84 Hayate *Frank*

Just as the *Zero* basked in glory early in the Pacific War, another fighter-interceptor premiered during the last two years. The Nakajima KI84 Hayate, known as the *Frank*, was Japan's answer to the more advanced planes the Allies developed after facing the A6M series. In fact, intensive testing after the war confirmed that the *Frank* outflew both the *Hellcat* and the *Corsair*.

The factors that gave the *Frank* its speed and maneuverability included an advanced, direct-injection engine and a compact body style. The low-wing monoplane was made completely of metal, although later versions used wood when raw materials became scarce. The KI84 had a retractable landing apparatus and used the same flush riveting as the *Zero*. After the first prototypes were tested, it became evident that the new fighter had hydraulic problems and that the closely encased engine would require considerable maintenance. As a result of improper heat treatment, the landing gear tended to snap due to structural failure during landings.

Engineers at Nakajima worked hard to remedy these problems, producing a fighter capable of quick climbs and turns. Mass production of the first model began in October 1943, with a total of 3,514 built in two separate subseries. The second version (KI84-2) was armed with two additional 20mm cannon and two 30mm guns, making the *Frank* an excellent bomber interceptor.

Frank fought its earliest battles in China against General Claire Chennault's "Flying Tiger" squadron. Later, it was deployed in the Philippine Islands. Production slowed drastically after the Allies began bombing Japanese factories. By the end of the war, approximately 3,500 *Frank* model aircraft had rolled off the production lines.

Interceptor/Fighter/Bomber

Max. Speed.....388 mph	Weight Empty5,864 lbs.
Ceiling.....34,540 ft.	Weight Loaded8,276 lbs.
Range.....1,052 mi.	Wingspan36 ft. 11 in.
Climb Rate.....3,600 ft./min.	Length32 ft. 7 in.
CrewOne	Height11 ft. 1 in.
Engine.....1,900-hp Nakajima Homare Ha-45 Model 11, 18-cylinder 2-row radial, air-cooled	
OriginNakajima Hikoki KK and Mansyu Hikoki Seizo KK	
ArmamentTwo 20mm Ho-5 cannon on the wings (150 rounds apiece)	
Two 12.7mm machine guns mounted on the fuselage (350 rounds each)	
Wing racks for 1,000 lbs. of bombs	
History.....March 1943 — First flight occurs	
April 1944 — First production delivery	

● Mitsubishi A6M7 Zero (Suicide)

Development of "kamikazes," or suicide bombers, occurred during the latter months 1944, when Japan began to lose ground in the Pacific. Aerial forces were spread thin, and the once superior technology of the A6M5 *Zero* fell to a new wave of Allied fighters such as the Grumman F6F *Hellcat*. Unable to keep pace with the rapid change in aeronautical engineering, Japan searched vainly for a way to regain air superiority. The method they chose involved sending pilots on suicide missions.

The practice of kamikaze attacks stemmed from the belief that dying for one's country was the ultimate honor. This philosophy was a fundamental element of Japanese combat ethics and led to the acceptance of kamikaze missions as an offensive tactic in 1944. The Imperial Navy decided to develop planes singularly for this purpose — explosive-packed planes without landing gear.

Until these manned bombs rolled off the production lines, however, Japan had to create an interim aircraft capable of suicide bombing missions. While the new *Baka* suicide planes were in production, the Imperial Navy converted many *Zero* models into makeshift kamikaze planes (A6M7 models). Explosives, usually 551-lb. bombs, were fitted onto the fuselage of the older A6M2s and A6M5s. Young, inexperienced pilots would voluntarily make lethal dives into Allied vessels.

The Imperial Navy expended more *Zeros* in kamikaze attacks than any other type of plane, even more than the *Bakas* later produced solely for these missions. The first massive kamikaze attacks occurred during the Battle of Leyte Gulf. Half of the 331 planes met their marks, sinking or destroying several American carriers.

Single-Seat Fighter

<i>Max. Speed</i>351 mph	<i>Weight Empty</i>4,175 lbs.
<i>Ceiling</i>32,810 ft.	<i>Weight Loaded</i>6,025 lbs.
<i>Range</i>1,930 mi.	<i>Wingspan</i>36 ft. 1 in.
<i>Climb Rate</i>2,812 ft./min.	<i>Length</i>29 ft. 11 in.
<i>Crew</i>One	<i>Height</i>11 ft. 6 in.

Engine.....950-hp Nakajima NK1C Sakae 12, 14-cylinder radial, air-cooled

OriginMitsubishi Jukogyo KK

ArmamentOne 551-lb. bomb built into the fuselage

Two 7.7mm machine guns mounted above front fuselage with limited ammunition

Two 20mm cannon fixed on outer wings with limited ammunition

HistoryMay 1937 — Imperial Navy issues specifications for original A6M5 *Zero*

August 1944 — Navy converts A6M2s and older A6M5s into A6M7 suicide bombers

(See illustration of Zero on p.44.)

● Yokosuka MXY-7 Ohka *Baka*

As the Pacific War progressed, the Japanese Navy began to lose the initial edge the Zero fighter planes had over Allied aircraft. Imperial aeronautical technology lagged behind as the Allies constructed sturdier, faster fighters. A loss of experienced pilots aided the decline of the Zero. The Japanese belief that the Zero was invincible hampered any further refinement of the A6M5 and A6M6 series.

In a desperate effort to turn the tide of the war after the Allied successes in 1943, the Imperial Navy developed the Yokosuka MXY-7, a rocket-powered glider with a half-ton of tri-nitroaminal explosives mounted within its nose. Without landing gear, this single-rocket engine was designed to send the plane and pilot hurtling toward Allied ships on "kamikaze" suicide missions. Allies later dubbed the MXY-7 "*Baka*," a Japanese word that translates as "fool."

Japanese pilots subscribed to a code of honor that emphasized victory or death. This ethical code superseded any sense of self-preservation for the volunteer "kamikaze" pilots. Before takeoff, each kamikaze pilot received his last rites. Then, a G4M *Betty* transported the *Baka* to the combat zone and released it approximately 30-50 miles from its target. The pilot would approach the ship, go into a steep dive and train his sights on the target. The explosives loaded into the plane caused immense damage when the nose of the aircraft slammed into the vessel.

Early in the war, many Japanese pilots would steer doomed planes toward ships to cause maximum damage and heroically sacrifice their life for the cause of their country. But, it was not until the Battle at Leyte Gulf that kamikaze attacks were officially employed as a tactic to damage the enemy's ships. In the battles for Iwo Jima and Okinawa, mass suicide attacks by *Bakas* and other planes were flown in a desperate attempt to thwart the powerful Allied invasion force. A total of 854 *Bakas* were built during the last few months of the war. The Japanese sacrificed over 3,000 pilots and planes in this vain effort to keep the Allies out of Japan.

Single-Seat Piloted Missile

Max. Speed.....	527 mph	Weight Empty	955 lbs.
Final Dive Speed ..	613 mph	Weight Loaded	4,698 lbs.
Ceiling.....	26,800 ft.	Wingspan	16 ft 3 in.
Range	52 mi.	Length	19 ft. 8 in.
Crew	One	Height	13 ft. 9 in.

EngineType 4 Model 20 rocket motor with 1,750 lbs. of thrust

OriginDai-Ichi Kaigun Koku Gijitsusho, Yokosuka
600 Model built by Dai-Ichi Kaigun Kokusho

ArmamentWarhead with approximately 2,700 lbs. of tri-nitroaminol

HistoryAugust 1944 — Mitsuo Ohta, a Navy official, proposes idea
April 1945 — Battleship *Virginia* becomes first victim of *Baka* attacks

(For a photograph of a *Baka*, see p. 32.)

★ Grumman F8F-1 *Bearcat*

By mid-1943, the *Corsair* and *Hellcat* fighters had established their superiority over most Japanese fighters. However, the American Navy wanted to be ready when the Japanese came out with their next generation of planes. The *Bearcat* was designed to replace the *Hellcat* as a low-to-medium altitude interceptor airplane. After test flying a captured *Focke Wulf* fighter, Grumman engineer Bob Hall was convinced of the need for a small, light fighter with exceptional speed and maneuverability.

The resulting prototype attempted to improve speed, maneuverability and pilot protection in a frame similar to that of the *Wildcat*. A new bubble canopy allowed the pilot greater visibility in all directions. Revolutionary break-away wingtips would snap off under extreme stress, saving the wings themselves and allowing the pilot to return home safely. (These were removed later due to several fatal crashes.) The airplanes were also plagued by a multitude of mechanical failures and other shortcomings which were attributable to their extremely small surface area.

During test flights in November 1943, the *Bearcat* demonstrated impressive speeds and maneuverability. The Navy immediately ordered a sizable number of fighters, which rolled off the production line in October 1944. The F8F-1s were produced with great haste since the U.S. Navy wanted the fighters for Operation Olympic, the invasion of Japan, in November 1945. The first *Bearcat* squadron, formed in May 1945 at Santa Rosa, California, was soon headed for the warzone. It was there that the news of Japan's surrender reached the squadron. Thus, the *Bearcat* never saw action in World War II. Grumman continued to produce the fighter in modest numbers. Several aircraft were later sold to South Vietnam and Thailand, where they actually saw combat action into the 1960s.

Fighter-Bomber/Night Fighter

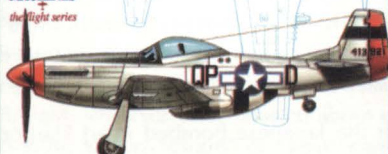
Max. Speed.....423 mph	Weight Empty7,170 lbs.
Ceiling.....38,800 ft.	Weight Loaded12,900 lbs.
Range.....1,200 mi.	Wingspan35 ft. 9 in.
Climb Rate.....4,900 ft./min.	Length27 ft. 10 in.
CrewOne	Height13 ft. 7 in.
Engine.....One 2,100-hp Pratt & Whitney R-2800-34 W radial	
OriginGrumman Aircraft Engineering Corporation	
ArmamentFour .50-caliber machine guns	
History.....August 1944 — First flight occurs (XF8F-1)	
	July 1945 — First production delivery
	August 1945 — Enters combat
	1955 — Retires from combat

(The *Bearcat* is not illustrated in this manual.)

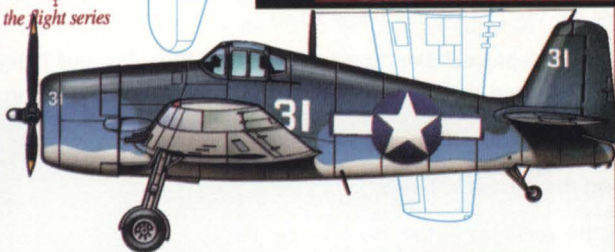
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SHIPS

Before the advent of modern naval aviation, nations measured their sea power according to the number of battleships each had. These mighty ships, supplemented by squadrons of cruisers and destroyers, were expected to wage the decisive naval battles that determined the course of war at sea.

After the Japanese bombed Pearl Harbor, however, the U.S. battleship fleet was tremendously crippled. Forced to abandon their dependence on the mighty ships, the Americans used carriers to battle Japan.

These carriers deployed dive bombers, torpedo bombers and fighters across the Pacific and changed the face of naval warfare. Normally, a task force would form around one carrier, a fast battleship and several cruisers and destroyers. While the carrier launched its attacks, the cruisers and destroyers would rescue downed pilots and protect the carrier with their anti-aircraft fire.

As the battle ventured further from home, the U.S. employed other vessels to aid the Pacific-based troops, such as amphibious landing craft and transport vessels.

—★—
This officer
stands near
the killboard
on a Japanese
carrier
from the
Pearl Harbor
attack force.
(1941)



Carriers

Carriers conducted most of the warfare in the Pacific by launching fighters and bombers, which in turn attacked enemy ships. The carriers were equipped with painted wooden decks that served as runways. Elevators on the runway lifted planes from a storage deck underneath. A wire mesh barrier was meant to halt runaway planes, although aircraft occasionally tore through and plunged into the sea. A large bridge on one side of the landing deck served as an observation tower and housed the ship's anti-aircraft armament.

U.S. The first heavy U.S. carriers, such as *Lexington* and *Saratoga*, were initially designed as battlecruisers, but were converted to carrier vessels during construction. Most heavy carriers were over 1,000 feet long and could carry around 90 planes and three to five thousand crew members. Standard defense consisted of 5-inch (.38-caliber) guns, anti-aircraft guns and machine guns. Later in the war, heavier armament became necessary to defend against incoming kamikaze planes.

Serving as escorts for convoys, some of the early light carriers were converted from merchant ships. These modified ships were equipped with a flight deck, a hangar and anti-aircraft guns. Later, light carriers were powered by at least four turbine engines and measured over 800 feet long. With a crew count near 2,000, these vessels could squeeze from 75 to 100 planes into the loading deck and still travel at a speed of 33 knots. In addition to aircraft, light carriers usually boasted about eight 5-inch machine guns and 16 anti-aircraft guns. Called "escort" or "jeep" carriers, these vessels ferried planes across the Pacific and added air support for ground attacks. These carriers weren't considered to be combat-capable. However, they fought in the naval battle at Leyte Gulf after being surprised by the Japanese forces.



— ★ —
*Silhouetted
 against the
 lightening sky,
 rows of
 Wildcats await
 an early
 morning
 takeoff from
 the USS
 Lexington.*
 — ★ —

Japan. The Imperial heavy carrier fleet launched the planes that pounded the U.S. vessels in Pearl Harbor and the South Pacific. During the first strike of the war, six of these vessels carried a total of 360 torpedo bombers, dive bombers and fighters to Pearl Harbor. Measuring 93 feet across and a full 826 feet in length, a typical heavy carrier could travel great distances at a cruising speed of 31 knots. Powered by 131,000 horsepower, they could haul over 75 planes and 1,500 troops. Defense consisted of sixteen 5-inch guns and several dozen anti-aircraft guns.

Japan's light carriers were versatile, although smaller than their heavier counterparts. The Imperial Navy began using these vessels in the early 1930s and continued to rely on them throughout the conflict with the United States. These carriers fought in China and the Philippines, as well as in the Aleutian Islands. The Japanese often used their light carriers to provide air cover for warship task forces that did not contain big carriers.

Most light Japanese carriers measured 590 feet in length and 68 feet across and, at full capacity, could carry 48 planes and 920 crew members. Traveling at 29 knots, light carriers could range 1,000 miles away from base without refueling. The Japanese named both their light and heavy carriers after mythical flying objects, animals or large birds.

Battleships

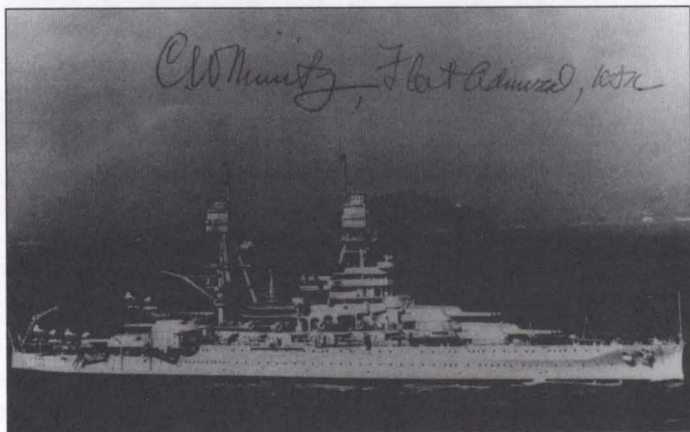
U.S. Even though carriers were beginning to transform naval battles into air conflicts, battleships still operated within a typical fleet formation. The older battleships constructed during and after World War I were hulking, slow and minimally armed. Most of the U.S. Navy's older battleships were docked in "Battleship Row" when the Japanese attacked Pearl Harbor. Almost all of them were demolished during this raid, although five managed to return to duty after extensive repairs.

Many of the older American battleships lacked the speed to keep pace with the faster carriers, so they were used to bombard islands before ground attacks and to "hold the line of battle" in waters held by the Allies. Newer battleships traveled faster and formed effective anti-aircraft gunnery platforms. Later, the U.S. Navy constructed faster battleships that were the same size as the regular ones but had more powerful engines and armament.

The presence of the battleship bolstered the effectiveness of the American carrier task forces. Because of its size, it often misled the Japanese into thinking that they were attacking a carrier. Battleships were the best performers in naval engagements or bombardment attacks and provided valuable anti-aircraft protection during combat. Most large battleships were around 600 feet long and cruised at a top speed of 21 knots. Initial weaponry included an assortment of 16-inch guns, 5-inch guns and machine guns. As the war progressed, more armament was added.

— ★ —
*Sailing here
 in all its
 glory, the
 USS Arizona
 would soon
 fall victim to
 the December
 7 attack on
 Pearl Harbor.*

— ★ —



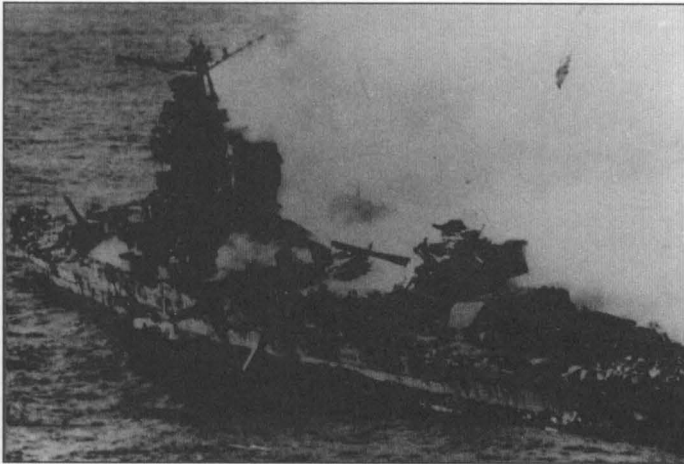
Japan. Battleships were the largest vessels in the Imperial Navy, measuring 600 to 800 feet long and 100 feet wide. They were protected by thick armor in the hull and as much as 8 inches of steel on the upper deck. Several 150,000-hp engines powered the monstrous *Yamato* class ships, although the smaller battleships had only two-thirds this power. They could carry a crew of 3,000 to 5,000 men across the Pacific at a speed of 25 knots. Battleships had a number of 16-inch guns (except for the *Yamato* class, which had 18-inch guns) and anti-aircraft guns. Additionally, they used launching catapults for the few scouting aircraft they carried on board.

Japan's heavy battleships participated in engagements throughout the Pacific, although many were sunk with the advent of carrier-based combat. After the loss of carriers at the Battle of Midway, the Japanese converted several of their battleships into carriers. Most vessels were christened with names of ancient provinces, although four battleships were named for mountains.

Cruisers

U.S. Throughout World War II, the U.S. bolstered its sea-going forces by producing smaller, faster ships with light armor and weapons. Called *cruisers*, they functioned as escort vessels for battleships. Normally, several cruisers would sail with a carrier, a fast battleship and a few destroyers.

An intermediate step between destroyers and battleships, cruisers were generally much faster than other navy ships. Light cruisers, such as the *Brooklyn*, measured over 600 feet long, cruised at a top speed of 32 knots and carried a 1,200-man crew. Armament consisted of 5- and 6-inch guns, along with an array of machine guns.



— ★ —
This Japanese heavy cruiser lies dead in the water near Midway after massive bombing attacks by Dauntlesses.
 (1942)

— ★ —

Japan. Like their U.S. equivalents, Japanese cruisers served as swift attack vessels. Light cruisers often were the lead ships in a fleet of destroyers. They were outfitted with above-water torpedo tubes and a deck armored with 50 millimeters of steel. Standard armament included an array of anti-aircraft guns and machine guns. Cruisers measured 400 to 600 feet long and could travel up to 8,000 miles. The Japanese named their cruisers after mountains and rivers.

While the U.S. Navy depended on big guns, the Japanese believed that the torpedo was the supreme weapon in seafare combat. The Imperial Navy equipped almost every ship in the Japanese forces with torpedoes, while destroyers and torpedo boats were the only U.S. ships to carry them. The Japanese had superior torpedoing abilities, especially when the Type 96 Long Lance was developed. It could be dropped from an altitude of 500 feet and traveled at 45 knots. Unlike U.S. torpedoes, the Long Lances were fairly accurate and almost always exploded on contact.

Destroyers

U.S. American destroyers evolved from torpedo boats, vessels whose main function was to attack enemy ships with torpedoes. Destroyers differed from their predecessors in that they had an assortment of 5-inch guns, machine guns and torpedoes as their primary offensive weapons. Typical U.S. destroyers measured 375 feet in length and traveled at a speed of 36 knots, making them quite versatile during battle. Vessels of this type carried 250 to 350 crew members and had minimal protective armor.

Smaller than carriers or battleships, destroyers hunted submarines, guarded convoys and fought in numerous enemy confrontations. Additionally, they performed mine-sweeping duties and supported amphibious attacks. One role of destroyers was to "screen" the fleet during combat. If another vessel in the fleet was engaging the enemy, the destroyers would fire their torpedoes and then let the big ships slug it out. If its fleet was retreating, the destroyers would fire torpedoes and force the pursuing enemy to dodge and turn away.

— ★ —
*A Japanese
 kamikaze
 topples the
 bridge of the
 USS Franklin.*



Japan. During World War II, Japanese destroyers escorted warships and hunted Allied submarines and ships. The Imperial Navy even used destroyers to carry troops (called "ant freight" infantry) and supplies. Once they lost the air war, the Japanese were forced to use destroyers instead of transports to deliver food, fuel and reinforcements to their islands. The destroyers had little cargo space, but their speed allowed them to make long trips entirely under the cover of darkness. Sometimes, destroyers were used to tow supply barges.

Armament on a Japanese destroyer consisted of torpedo tubes, anti-aircraft guns, main guns, machine guns, depth charges and mines. Up to 200 crew members could travel on these 380-foot-long vessels. *Fubuki* class destroyers traveled at a speed around 35 knots — much faster than most other Imperial ships. Japanese destroyers were given names corresponding to poetic readings of weather conditions. Later in the war, small destroyers were named after fruit, trees and flowers.

Amphibious Craft

U.S. As the U.S. Navy pushed its way across the Pacific, it needed to establish footholds in the Pacific Islands. To maintain remote bases, the navy had to transport vast quantities of equipment, fuel and supplies to locations without docking facilities. The U.S. solved this problem by constructing the LST (landing ship tank), which was able to deploy armored vehicles and tracked amphibious-assault units on remote beaches.

Amphibious craft could travel at a speed of 11.6 knots and ranged from 25 to 450 feet long. The smaller amphibious vehicles could crawl onshore after being transported by large vessels. The larger 450-foot ships supplied the Pacific forces with up to 175 men and numerous supplies. Some amphibious craft carried anti-aircraft guns and 5-inch weapons.

Japan. The Imperial amphibious craft were supply barges that steamed along the coast at night and hid during the day, transporting fuel, supplies and equipment to isolated beaches. Operating in shallow depths, these craft could dispense battle-ready troops hundreds of miles from the mainland. Amphibious vessels also aided in removing troops and supplies from the Pacific Islands.



— ★ —
*Island
 invasions
 often utilized
 amphibious
 vessels
 to move
 men and
 equipment
 onshore.*
 — ★ —

Transport Ships

The war in the Pacific was complicated by the fact that neither Japan nor the U.S. fought on home soil. Both countries had to convey troops and war equipment to fleets and bases throughout the Pacific. To solve this problem, they used transport ships. Transport vessels were large ships that carried troops, supplies, equipment and fuel — many were commercial cargo ships that were modified to suit the Navy's needs. Some of these transport ships had docking wells that allowed small landing craft to dock on the transport ship.

Although Japan had less distance to cover than the U.S., troops and war equipment still had to be distributed to carriers and bases in the Pacific. Like their American opponents, Japan used transport vessels to move supplies and troops. These "trucks of the sea" supplied the Japanese forces with the supplies and munitions they needed for their expansion across the Pacific.

WEAPONS

U.S. and Japanese forces fought using the same array of weapons — machine guns, cannon, bombs, torpedoes and missiles. As the quality of Japanese and American airplanes improved, the need for greater firepower increased. In response, many weapons were modified and refined during the course of the war.

UNITED STATES

.30-Caliber Machine Gun. This sturdy weapon evolved from the Vickers .303-caliber gun. It remained popular after World War I but declined in use as planes became more resistant to gunfire. The Colt-Browning weapon rattled off over 1,200 rounds per minute (rpm) and could down any target within 1,970 feet. Eventually, the .50-caliber gun reassigned the .30-caliber version to tailgunner duty in the *Avenger* and *Dauntless* planes.

.50-Caliber Machine Gun. The weapon of choice during World War II, this Colt-Browning machine gun provided forward gunning power for the *Wildcat*, *Hellcat* and other U.S. fighters. The non-armored Japanese *Zeros* often fell prey to piercing bullets from Allied planes and sometimes exploded when hit. Some pilots claimed that this gun was superior to the 20mm cannon due to its 7,200-yard range, accuracy and large slugs. The .50-caliber gun fired 850 rounds per minute at a muzzle velocity of 2,660 feet per second.

20mm Cannon. The 20mm cannon superseded the .50-caliber machine gun as the need for firepower elevated. These projectiles fired more slowly than machine gun bullets and lost accuracy with distance, but they traveled farther than conventional slugs. The cannon shells were over half a foot long, allowing them to carry explosive charges and cause extensive damage when they hit a target.

Mark 13 and 14 Torpedoes. The capricious Mark 13 and 14 torpedoes had unimpressive warheads that often failed to explode, even if they did strike their targets. Others exploded upon launch from the aircraft. The torpedoes were labeled unreliable, although they sank many naval vessels on both sides. The Mark 13 air-launched torpedo cruised at 33.5 knots, carried 2,000 pounds of explosives and had a 6,300-yard range. The Mark 14 sub-launched version could travel at 31 knots and could carry a 668-pound warhead 9,000 yards.. The Mark 13 torpedo was dangerous to launch because pilots had to fly at very low altitudes and speeds in order to drop it.

Bombs. Bombs were major instruments of destruction for both Imperial and Allied forces. U.S. planes carried bombs of varying weight — light (250 lbs.), medium (500 lbs.) and heavy (1,000 lbs.). Later in the war, some Allied planes substituted highly explosive bombs filled with gelatinous gasoline for ordinary bombs.

HVAR. High-Velocity Aerial Rockets (HVAR) made their appearance late in the war and were added to the *Hellcat*, *Corsair*, *Bearcat*, *Avenger*, *Helldiver* and a late version of the *Wildcat*. The 134-pound rockets were originally launched from bazooka-like tubes under the plane and eventually mounted on racks. HVARS measured 5 inches wide and 5'9" inches long.

JAPAN

7.7mm Machine Gun. The 7.7mm machine gun was standard armament for most Japanese combat aircraft. Its bullets were comparable to those fired by the Colt-Browning .30-caliber guns, firing 900 rpm within a range of 1,970 feet. One version, the Type 97, was mounted on the top of the engine cowling on planes such as the *Zero*. Another tailgun version used a flexible mounting to allow gunning from the rear. It could fire 1,500 rpm a distance of 1,970 feet. Both types were belt-fed in flexible strips containing 30 bullets. The 7.7mm gun cycled at 450 rounds per minute, with a muzzle velocity of almost 2,400 feet per second.

12.7mm Type 1 Machine Gun. Just as the Colt-Browning .50-caliber gun replaced the outdated .30-caliber version, the 12.7mm gun replaced the 7.7mm gun on most Japanese planes built later in the war. The bullets were larger than those used in the 7.7mm version but not as deadly as cannon projectiles. The fixed or flexible 12.7mm guns fired 900 rpm a distance of 2,460 feet and had a range close to 2,500 feet.

20mm Type 99 Cannon (2 types). The Japanese almost always used a cannon in conjunction with the 7.7mm or 12.7mm machine gun. The cannon proved to be a highly effective weapon, firing anywhere from 490 to 750 shells per minute, while the velocity ranged from 2,600 to 3,280 feet per second. Most magazines held only 60 shells, forcing the Japanese pilots to use their cannon sparingly.

Torpedoes (1,764-lb.). The Type 91 torpedo was Japan's major weapon during the dawn of the carrier battles and performed much more impressively than the American Mark 13 torpedo. During an attack, Japanese fighters would drop the torpedo from several hundred feet. Then, the projectile could travel up to 6,000 feet underwater at 43 knots and still accurately strike its target. Later, the Type 96 "Long Lance" outperformed this older model and gradually replaced the Type 91 torpedoes.

Bombs. Like the Allied forces, the Japanese used explosive firepower to destroy carrier ships and ground targets. The Imperial bombers *Kate* and *Betty* conducted the majority of the bombing missions and carried light (132 lbs.), medium (250 lbs.) and heavy (550 to 1,000 lbs.) bombs. Even most of the lighter Japanese planes had the ability to carry and release light-to-medium weight bombs.

DECORATIONS

The tradition of decoration began with the ancient Greeks, who awarded gallant soldiers gold buttons. More recently, medals and decorations have been presented by governments for military and civilian acts. Most medals are ornate metal badges suspended from ribbons, while decorations can consist of several elements — including a star, sash, collar or chain. Many countries award colored ribbons that are worn on military uniforms in place of the actual medals.

UNITED STATES

Congressional Medal of Honor. This medal was created during Abraham Lincoln's presidency and can be awarded during war or peacetime for a heroic act. It is the oldest U.S. decoration still in use, first awarded in March 1863 during the Civil War. A person may receive this medal only once; subsequent awards are Gold Stars (small gold stars that represent subsequent awards of the same type) that are pinned onto the ribbon of the original medal.

Navy Cross. This award is bestowed upon Navy personnel who demonstrate exceptional heroism during combat. Created in 1919, it ranks second only to the Medal of Honor. Similarly to the congressional award, Gold Stars are awarded instead of a second Navy Cross.

Silver Star Medal. The Silver Star is given to individuals who demonstrate great heroism during combat. It ranks below the Congressional Medal and the Navy Cross.

Distinguished Service Cross. The Distinguished Service Cross was first awarded in 1918 by the U.S. Army to decorate soldiers who demonstrated exceptional heroism during combat. Later, it was adopted by the Navy (1919).

Distinguished Service Medal. This award ranks second to the Distinguished Service Cross and was first given in 1918. It is presented to those persons who provide exceptional service to their country either in combat or non-combat situations. Additional acts merit Gold Stars.

Purple Heart. This honor evolved from the Military Merit Badge given during George Washington's presidency in 1782 and was reinstated by Congress on the 200th anniversary of Washington's birth. Recipients seriously wounded during combat are awarded this medal and presented with Gold Stars for subsequent wounds.

Distinguished Flying Cross. The Flying Cross is awarded to crew members who demonstrate exceptional heroism during a combat or non-combat flight. As in the case of many other decorations, Gold Stars are given in place of additional medals.

Air Medal. Airborne individuals that perform meritorious acts in combat or non-combat situations receive an Air Medal. This award ranks below the Distinguished Flying Cross.

Campaign Medals. The military gives campaign medals to all members of the armed forces who served in major U.S. wars and engagements. Navy crews serving in the Pacific Ocean engagements received the Asiatic-Pacific Area campaign medal.

JAPAN

The Japanese credo of focusing on the group as a whole limits recognition for heroic individuals. However, Japan awards Orders of Merit according to rank, position and length of service. Distinguished acts by civilians and non-commissioned officers also warrant these medals. Different classes of merit exist, with each level having specific requirements.

Order of the Chrysanthemum (Kikkwa Daijasho). Established in 1876, this badge is conferred on members of the Royal Family. It consists of a star with 32 rays of varying length. The center of the star has a large garnet and a small silver chrysanthemum nestled between two green enameled leaves.

Order of the Paulownia Sun (Tokwa Dijasho). In existence since 1888, this is the highest grade of the Order of the Rising Sun (see below). The badge has a red sun with white and gold rays and the flower and leaves of the paulownia tree. Both elements are embodied in the Imperial Japanese arms.

Order of the Rising Sun (Kiokujitsasho). This order contains eight classes and was established in 1876. The decoration has a garnet in its center, from which 32 rays extend. Depending on the class, the Order of the Rising Sun badge has enameled paulownia leaves, a silver star, flowers and edgings of gold or silver.

Order of the Sacred Treasure (Zaihosho). This Order of Merit is frequently given to naval and military officers for service during war and peace. The award is symbolic of the three treasures of Japan's first emperor — a mirror, collar and several swords. The badge consists of an eight-pointed silver star on a circular background enameled in blue. These items are surrounded by 16 rubies and 20 rays of white enamel. Depending on the class, the edging is either silver or gold.

Order of the Golden Kite. Instituted in 1891, this badge has seven different classes and is awarded to officers and military personnel for bravery in action. According to legend, a kite once helped an early Japanese emperor win a battle. A kite emblem, a sword and two golden rods decorate a red background that bears the shape of an irregular red star.

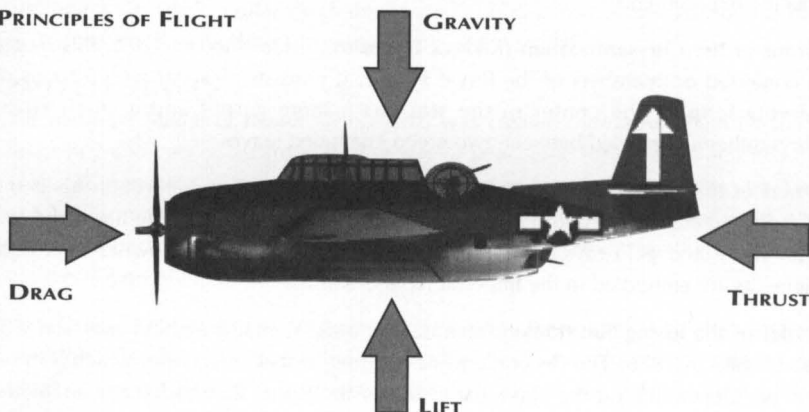
Posthumous Promotions. The one award Japan bestowed in great numbers was a promotion following death. Life was the ultimate sacrifice for a pilot, and the Japanese bestowed great honors to dead soldiers. A posthumous promotion was recognized as the greatest honor of the pilot's family.

Campaign Medals. Like their American counterparts, the Japanese military awarded campaign medals to people who served in certain combat zones.

PRINCIPLES OF FLIGHT

As a pilot, you should understand how to best use the air to your advantage. To help you prepare for your first flight, this section defines the aerodynamic principles that allow airplanes to take off and maneuver — lift, thrust, drag and gravity.

PRINCIPLES OF FLIGHT



Lift

Lift is the force that pushes the plane upward. As air passes at different speeds across the top and bottom surfaces of the wings, it causes a difference in pressure. This variance in pressure results in a lifting force that “pushes” under the wings and lifts the plane into the air. As the speed of the airflow increases, so does the lift. Lowering your flaps will increase lift but will also result in more drag.

Lift also changes with the shape of the wing and the angle at which the wing meets the airflow. If you increase the angle of the wing by climbing too steeply, you will disrupt the airflow over the wings. This will probably cause the aircraft to stall. If you do stall, diving should increase your speed (and lift), allowing you to regain control of the plane.

Because lift depends on the shape of the wing, it will always pull toward the top of the wing. If you are flying upside down, note that lift will pull you toward the ground.

Thrust

Thrust is the forward force applied to your plane by its engines and propellers. During level flight, the rotation of the propellers causes air to move over the blades. This moves the plane forward, providing the wings with the airflow needed to create lift. Thrust is always applied in the same direction as the airflow over the propellers.

You can increase the amount of thrust by increasing your throttle setting. If you do not have enough thrust to keep your plane moving forward, you will lose lift and your plane will stall. If your nose is pointed downward, both thrust and gravity are pulling your plane downward as well.

Drag

Drag is the force that counteracts the forward motion of your plane. It is caused by the resistance of the air flowing around the airframe. Smooth plane surfaces result in less drag, and therefore, more efficient flight. (This was more true during World War II than with today's planes.) During takeoff, lowered flaps and extended landing gear cause drag. In order to reduce air resistance, raise your landing gear and flaps after you take off.

Gravity

The most fundamental force you encounter is *gravity*, the force that pulls your plane toward the ground. It is a constant force in that it is always applied in the same direction with virtually the same force. Your aircraft uses thrust and lift to counteract the effects of gravity and remain airborne.

G-Forces

One "G" is a measurement of force equal to the force exerted by the Earth's gravity on a stationary object. If gravity suddenly became twice as strong, you would experience two Gs. Note that a measurement of G-force is *not* the same as gravity, which is a constant force toward the center of the Earth.

G-forces are caused by sudden changes in velocity, such as when you twist and turn the plane rapidly in the air. You experience a G-force change on a small scale every time you ride an elevator in an office building.

G-forces can be classified as either positive or negative. Positive Gs make you feel heavier because they pull you relatively downward. Negative Gs make you feel lighter and pull you relatively upward. Remember, when you are upside down, your relative "up" is pointed toward the ground.

Positive G-forces, such as those experienced during sharp turns or climbs, cause your body to pump less oxygen to your brain. The force pulls blood away from your retinas and brain, causing a temporary loss of color vision. Eventually, your vision will black out.

Negative Gs, experienced during steep dives, have the opposite effect — they force an overflow of blood to the brain. This high blood pressure causes the capillaries in your eyes to swell or rupture, resulting in a reddening of your vision.

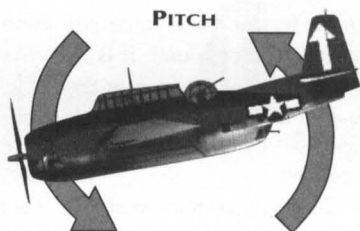
A normal adult can withstand 8 to 9 positive Gs or 2 to 3 negative Gs for short periods of time without suffering permanent damage. Under extreme circumstances, a human can survive more than 30 positive Gs if the force is not sustained. Because of the difference in tolerance for positive and negative Gs, most pilots favor maneuvers that apply positive Gs, like the inverted dive.

MANEUVERING VECTORS

Now that you know what forces interact with your airplane during flight, you are ready for the basic maneuvering vectors you will utilize as a pilot — pitch, yaw and roll. This section describes these basic vectors. As you gain flight experience, you will learn what combinations of pitch, yaw and roll are most effective.

Pitch

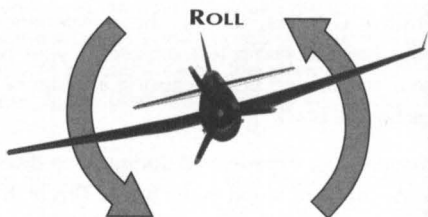
Pitch is rotation about an axis running through your plane from wingtip to wingtip. If you tilt the nose of the plane up or down, you change its pitch. As mentioned earlier, the elevators on the tail of the plane adjust your pitch. To pitch the plane upward, pull your control stick toward you. To descend, gradually push the control stick away from you. Beware of changing the pitch too drastically — this can disrupt the air flow around the wings and cause your plane to stall.



NOTE: Pitch remains relative to your plane's top and bottom — if you are rolled onto your side, a change in pitch will cause a banked turn.

Roll

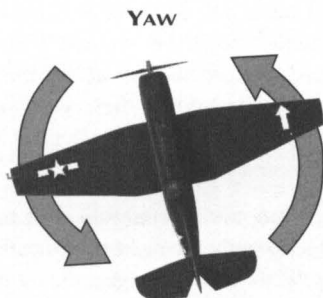
A *roll* is rotation about an axis running through your plane from nose to tail. During a roll, the plane's wings move up or down, but the aircraft continues to fly a straight course. If you push your control stick to either the right or left, you will spin about this axis. Rolling results from the complementary movement of the left and right ailerons — if the left aileron tilts up, the right will tilt down, and vice-versa.



Bank. You can combine a roll and pitch to *bank* the plane to the left (nose up, roll counterclockwise) or right (nose up, roll clockwise). However, pitching *and* rolling the plane reduces the amount of lift and increases drag. To offset the resulting loss in speed, you may need to increase your throttle before you perform a bank.

Yaw

Yaw is rotation about an axis running vertically through your plane. These "flat turns" occur when you change the heading of your plane without changing its vertical orientation. If you turn the rudder to the left (using), you can steer the plane to the left. Likewise, turning the rudder to the right (using) causes the plane to veer to the right. Though you can turn purely through yaw, a much more effective way is to use a banked turn.



CONTROL SURFACES

An airplane uses several different components to control the flow of air. Each part interacts with the air to create forces and movement:

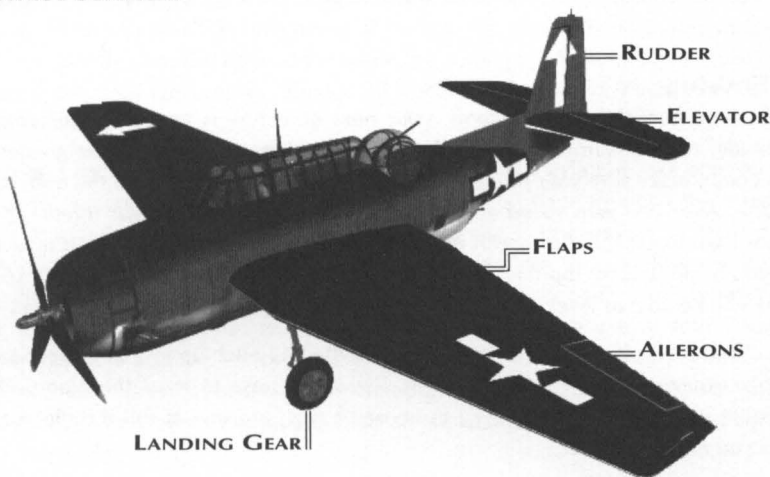
Rudder. Yaws the plane left or right (or)

Flap. Changes the shape of the wing, creating lift during takeoff and landing, but also more drag ()

Aileron. Rolls the plane clockwise or counterclockwise (joystick or)

Elevator. Pitches the nose of the plane up or down (joystick or)

CONTROL SURFACES



FLIGHT TACTICS

The Pacific theater of World War II produced dozens of aces in the dogfight arena. Japanese pilots gained years of experience during the conflicts with China, while American fliers were well-trained in the basics of flight and then thrown into newly developed fighters halfway across the world. Lacking actual combat experience, American pilots refined their techniques during actual sparring with seasoned Japanese fighters. Pilots on both sides left behind a vast array of tactics to be used by pilots in years to come.

Although you could simply try to learn like any rookie flier, it would be to your advantage to study the flight tactics outlined in this manual. Just as in the real world, learning to fly combat engagements involves much more than jumping into the cockpit and manning the cannon. First, you must familiarize yourself with the principles of flight. Then, you must practice the basic maneuvers that will carry you to your future dogfight and bombing missions. Finally, you need to learn the standard offensive and defensive moves to help you survive and succeed in *Pacific Strike*.

Takeoff

Most of your missions will require taking off from an aircraft carrier. Before you take off, be sure to perform a pre-flight check (see **Playguide**). Once you have done this, you are ready to launch your aircraft. To start your takeoff, lower your flaps (press **F**). Then increase your throttle to 100 percent (using **1-0**, with **0** being full throttle). As your plane gains speed and lift, you will notice that your tail rises. When this happens, slightly raise the nose of the plane by pulling the joystick toward you or by pressing **↓**.

NOTE: The game has an "autopilot" feature that will automatically perform your takeoff for you. If you wish to use this function, press **A** when you are ready for takeoff.

Climbing

After you complete your takeoff, your next objective is to reach your cruising altitude. As you learned in **Principles of Flight**, higher speeds generate greater lift. To climb, make sure your throttle is at full speed (**0**) and then raise the nose of the plane. After you gain speed and altitude, retract your landing gear (press **L**) and your flaps (press **F**). Be careful not to climb too quickly or your aircraft may stall. If you begin to stall, dip the nose of the plane. Once you descend and gain speed, you will be able to level out and begin climbing again, this time more gradually.

To climb most efficiently, use maximum throttle and pitch up to a 20-degree angle. Once you reach the desired altitude, lower the nose to level the plane. Then, throttle back (again using **1-0**) to conserve fuel; cruising at full throttle guzzles gas you may need later.

Descending

You can decrease your altitude in two ways: reducing your throttle (using [1]-[0]) or lowering the nose of the plane (pushing the joystick away from you or pressing [↑]). Slowing down reduces lift, allowing you to gradually lose altitude without gaining speed. Diving lets you descend rapidly while increasing your speed.

Recovering from a Stall

You experience a stall whenever your airspeed drops below the minimum threshold for a particular plane to maintain its lift (close to 75 mph for the planes in the game). Stalling usually occurs during tight turns, loops, takeoffs and landings at slow speeds. As airspeed drops, less air flows over the control surfaces and lift also decreases. A loss of lift causes the control surfaces to become inoperable. The only way to recover from a stall is to gain airspeed. If you have sufficient altitude, let the plane fall until the speed picks up enough to generate lift. Otherwise, increase your throttle and be prepared to bail out.

Landing

When playing *Pacific Strike*, you can choose to land manually or you can let the autopilot perform the landing for you. If you are a new pilot, you may prefer to leave the landings up to the computer. As you become a seasoned flier, you will probably want to attempt landing both on airstrips and carriers. If you want to execute an autopilot landing, press [A] and the computer will take over.

Airstrip. When landing on an airstrip, start your approach from several miles away and adjust your altitude to 500 feet. Make sure you are lined up with the runway and reduce your throttle to 60 or 70 percent (press [6] or [7]). Before you begin your final descent, lower your landing gear (press [L]) and lower your flaps (press [F]). Reduce your throttle until you have almost reached stalling speed (around 75 mph). When you reach the beginning of the runway, your altitude should be about 25 feet. Gently raise the nose of the plane (by pulling the joystick toward you) and drop down onto the runway. Ideally, all three wheels should touch down at the same time.

Carrier. Landing on a carrier is the trickiest part of naval aviation. Not only do you have to contend with swells and a rocking ship; you have to catch the arresting wire in a limited landing strip. Once again, you can land manually or choose the autopilot feature (press [A]). To assist you in your landing, keep a close eye on the Landing Signal Officer (LSO). This invaluable crew member steers you to safety on the deck, correcting your approach as necessary and evaluating your landing. Although you may be tempted to guide yourself in, you should ignore your instincts and instead concentrate on signals given by the LSO. This officer always has a better view of your approach. (For an explanation of the LSO's hand signals, see **Playguide**.)

In reality, pilots approached along one side of the carrier at an altitude of 500 feet. Making four 180-degree passes by the carrier, they made their final approach to the rear, going into the wind. The LSO would then "cut his throat" with the landing paddles to endorse the landing or cross them over his head to wave the incoming pilot off for a second approach. In the game, however, you will make one approach to the rear of the carrier with the help of an LSO.

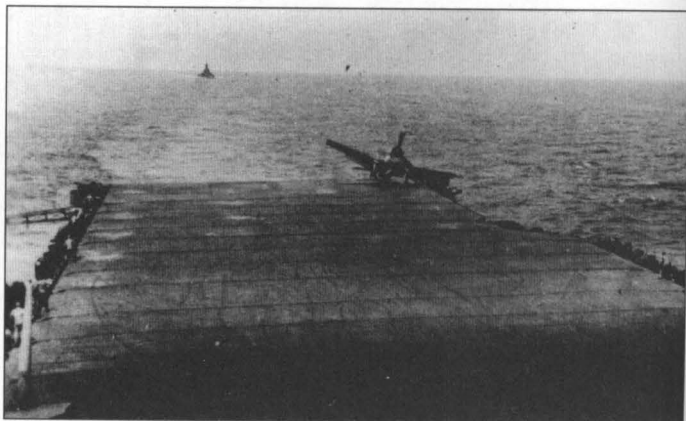
To land on a carrier, you should make sure that you have lowered your flaps (F), landing gear (L) and *arresting hook*. The arresting hook is the mechanism that catches on a thick wire on the deck and keeps your plane from plummeting into the ocean. (In the game, the hook is automatically lowered with your landing gear.) Reduce your throttle to 60 or 70 percent (press 6 or 7) and adjust your altitude to 100 feet. You should be traveling into the wind at this point and in the same direction as the carrier. Approximately 300 feet away from the ship, cut your engines so that you glide onto the landing deck. When you touch the deck, however, increase your throttle to full speed until the arresting hook catches. That way, if you miss the hook, you can take off and try again.

Bailing Out

The goal of any pilot is to carry out the assigned mission and return home safely. Unfortunately, air-to-air combat or flak fired from ships may damage your plane and force you to bail out. In the game, you can bail out by pressing Ctrl B. After you abandon your airplane, you can watch yourself drift down into the water or onto the ground. At this point, a message will appear that asks you if you wish to replay, abort or continue the mission (see **Playguide**). If you choose to continue, you will be able to fly subsequent missions.

Historically, pilots who bailed out had to make sure they jumped clear of the plane. If jumping from very high altitudes, they would usually free-fall until they were clear of other aircraft in the area. They also had to carefully judge when to open their chutes, since some enemy pilots took great pleasure in picking off parachuting pilots.

— ★ —
*Slightly off
 course, this
 Hellcat teeters
 on the edge of
 its carrier
 during a
 landing
 attempt.*



FLIGHT MANEUVERS

Roll

A *roll* does just what its name implies — you roll the plane around an imaginary axis extending horizontally from the nose through the tail of the aircraft. Rolls do not change your direction, but they may allow you to dodge fire until you are able to move away. To perform a roll, push the joystick to the left or right and release it when you wish to stop rolling. During World War II, pilots often used rolls as victory symbols and as a means of attracting attention in the event of a communications breakdown.

360° ROLL



Dive

The *dive* is a maneuver primarily used to attack an enemy plane or ship. It involves pitching down and descending at a steep angle. Before you go into a dive, make sure that you have enough altitude to do so safely. You should allow at least 1,000 feet between you and the ground at the end of your dive. Otherwise, you may not be able to pull up in time to avoid crashing. Next, push the joystick forward. This causes the nose of the plane to dip down. When you finish your dive, pull straight back on the joystick to raise the nose of the plane.

NOTE: If you dive too rapidly, your plane may experience *compressibility*. This phenomenon occurs when the dive nears 500 - 675 miles per hour, close to the speed of sound. Compressibility is a disruption of air flow over the control surfaces that is caused by a sonic shock wave. This places extreme stress on the airframe and may render the ailerons and elevators inoperable. To avoid compressibility during dives, lower your flaps or dive brakes (press [B]) and reduce your throttle. All three of these will slow your plane down.

DIVE



Barrel Roll

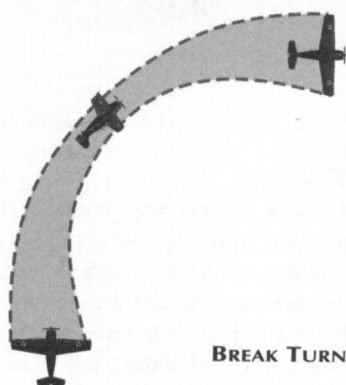
A *barrel roll* combines a normal roll with an increase in pitch. This produces a screw-like effect in which your plane spirals around an imaginary horizontal axis. To successfully carry out a barrel roll, push the joystick sharply to the left or right to roll the plane. At the same time, gently pull the nose of the plane up by moving the joystick toward you. This change in pitch will keep your plane oriented about the horizontal axis. This maneuver mimics the spiral of a corkscrew and is a useful evasive method if you are being tracked by enemy fire.

BARREL ROLL



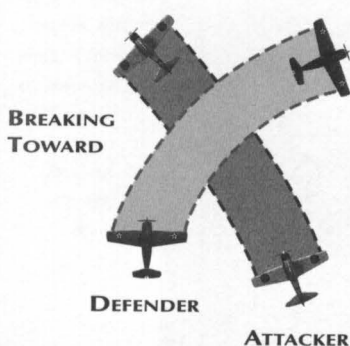
Break Turn

A *break turn* is an offensive or defensive turn used to change direction quickly. To conduct a break, make a hard roll (45 degrees or so) to one side by sharply pushing the joystick left or right. At the same time, pull the control stick straight back to raise the nose of your plane. This maneuver results in a sharp turn. Break turns are especially useful in dogfighting, which requires numerous changes in direction.



BREAK TURN

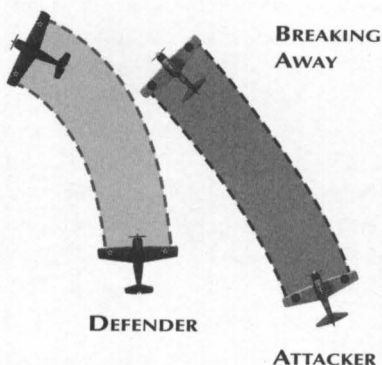
NOTE: If you and an enemy plane are moving toward a common point, you should always break *toward* your attacker. This will prevent the opposing plane from following your turn. It will also reduce the time that the attacker has you in his gunsight. If you break away from the other plane, the attacker will be able to form on your tail and shoot you at will.



BREAKING TOWARD

DEFENDER

ATTACKER



BREAKING AWAY

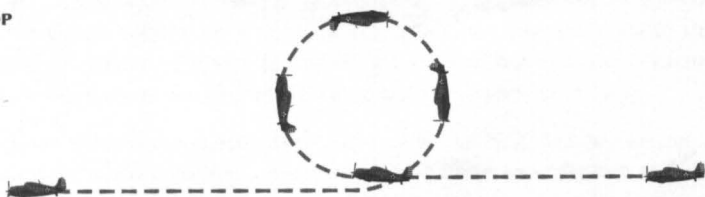
DEFENDER

ATTACKER

Loop

A *loop* is an offensive or defensive maneuver used mostly by maneuverable fighters. You perform a loop when you complete a full 360-degree vertical turn. To execute this maneuver, make sure you have enough momentum to compensate for the speed you lose during the loop. (You will learn the correct speed for each plane with practice.) Then, sharply pull back on the joystick so that you begin climbing. By keeping the joystick pulled toward you, you will continue to turn. The loop is complete when your plane is once again flying level and facing the same direction as when you started. When you finish the loop, release the pressure on the joystick. Remember, loops cause you to lose both speed and sometimes altitude, so you need to accelerate before attempting this maneuver.

LOOP

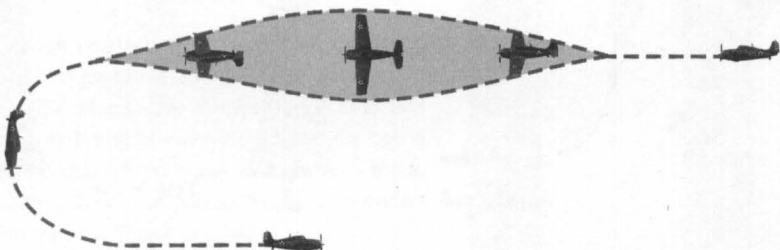


Split-S

You use *split-S* maneuvers to lose altitude and reverse direction. Additionally, your final speed increases as a result of a split-S turn. To perform this maneuver, make sure you are flying level and have ample altitude (several thousand feet). Then, roll the plane 180 degrees so that you are upside down. Pull back on the joystick to go into a half loop toward the ground. After you complete the half loop, release the joystick and straighten your course. You should now be flying level, but in the opposite direction and at a lower altitude.

Two main advantages of this move are that you increase your speed and pull *positive* G-forces instead of negative ones. Remember, the human body can withstand more positive Gs (8 to 9) than negative (2 to 3), so you will probably find this move a very useful defensive tactic.

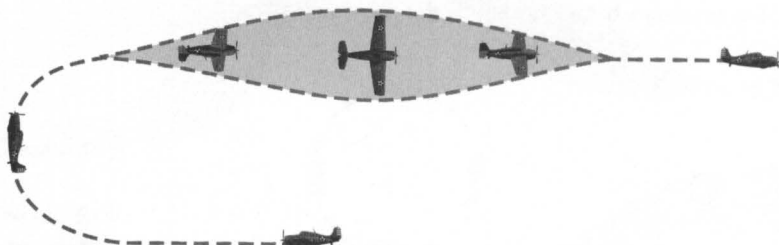
SPLIT-S



Immelmann

You use *Immelmanns* to gain altitude and reverse direction. This maneuver was named after a World War I German flying ace who used it when he passed under enemy aircraft flying in the opposite direction. To carry out this maneuver, level out your plane and increase your speed. Then, pull straight back on the joystick and go into a loop. At the top of the loop, perform a 180-degree roll and level out the plane so that you are again flying horizontally, but in the opposite direction.

IMMELMANN

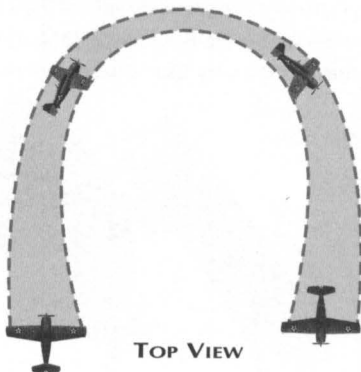
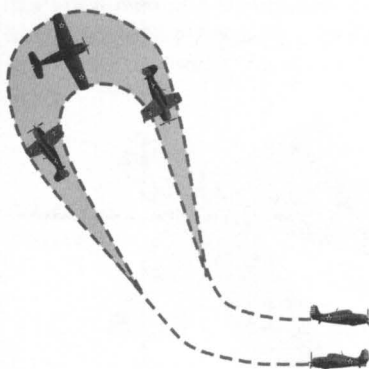


Wing Over

A *wing over* is similar to riding a skateboard up a ramp, turning, and then rolling back down the ramp. Your end position is the same as your start position, but you are facing the opposite direction. To carry out a wing over, pull the joystick toward you and begin a steep climb. When your plane begins to stall, turn your rudder. (In the game, you use ☐ or ☐ to turn the rudder to one side.) This causes the plane to turn as if it were pivoting on one wing. When the plane turns a full 180 degrees, straighten out the rudder and dive back into your original position.

WING OVER

CHANDELLE



TOP VIEW

Chandelle

Chandelles are wide half-turns that allow you to gain altitude and change direction. Planes flying at the front of a squadron often used this maneuver to engage enemies that were attacking from the rear. To conduct such a turn, roll your plane by gently pushing the joystick to the left or right. At the same time, pull back on the stick to increase the pitch of the nose and climb up. Sustain your bank until you have completed a 180-degree turn and then resume level flight. After completing a chandelle, you are facing the opposite direction and flying at a higher altitude.

Scissors

The *scissors* maneuver is nothing more than a series of banks back and forth, from left to right. You can scissor your aircraft by alternately pushing the joystick to either side. If you want to increase the tightness of your turns, use the rudder (□ or □) or the elevators (joystick). Scissoring is useful when you are trying to shake an opponent off your tail. If you are piloting the more maneuverable plane, your enemy may even pass you and allow you to train your guns on his tail.

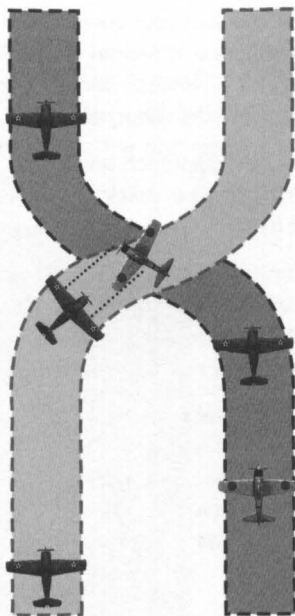
Many pilots utilized the scissor move, also called *jinking*, to keep an eye out for other aircraft. When escorting a group of bombers, the faster fighters could scissor alongside the other planes. This accomplished two things — it increased the pilot's field of vision, and it killed some of the fighter's speed and allowed it to stay with the slower bombers.

Thach Weave

If you fly with a wingman, the *Thach weave* is a good way for you and your partner to cover each other. This move originated with Jimmy Thach, a famous Navy pilot who was looking for a way to survive against the maneuverable *Zero* fighter. In this arrangement, you fly several hundred yards to one side of your wingman. If attacked, you can bank back toward the other plane. This leads the enemy plane directly into your wingman's line of fire. You and your partner can weave continuously back and forth by alternately banking left and right in a scissors maneuver.

The Thach weave was presented as a standard practice to all pilots after Thach conceived it during his stint in the Midway and Coral Sea battles. By flying in this formation, fliers could protect one another. Many *Zero* fighters made the fatal mistake of following their intended victim into the Thach weave.

THACH WEAWE



COMBAT

To successfully combat your enemy, you must identify your plane's strengths and weaknesses, while also taking your enemy's into consideration. You must be able to size up the situation and act accordingly. Two fundamental elements can tilt the balance in your favor — the element of surprise and a height advantage. Regardless of your advantage, victory or defeat depends on how well you can perform certain offensive and defensive maneuvers.

This section describes special attack and defense techniques you can apply during your missions. After studying these tactics, try applying them in flight. You may want to review **Principles of Flight** (pp. 74-75) and **Flight Maneuvers** (pp. 81-85) before you read this section.

Detecting the Enemy

During flight, you must remain alert and constantly scan in all directions for enemy aircraft. Surprise is the greatest advantage you can have as a pilot — if your approach remains unnoticed, you will be able to go on the offensive.

To avoid detection, you should try to fly above your enemy. Height can be a great advantage and can be turned into speed during diving attacks. Sometimes you can conceal your approach by flying directly between the sun and your opponent. The sun will blind your enemy. Remember, though, that you can be on the receiving end of one of these surreptitious attacks.

Homing in for the Kill

Once you spot your enemy (and if he hasn't seen you), your next goal is to remain undetected. First, try to locate the sun by using the multiple camera views (see **Playguide**). Then, position your plane so that you will eventually come between the sun and the enemy aircraft.

Begin your approach toward the opponent directly "out of the sun" so that he will be blind to your attack. A perfect attack of this type places the sun directly behind your back.

If you cannot use the sun to your advantage, gain altitude so that you are flying higher than your opponent. This does two things: it allows you to dive (trading height for speed), and it helps you avoid detection. You should practice "checking your six," or constantly turning to look up and behind for enemy aircraft.

Another good offensive tactic is to take advantage of your enemy's blind spots. In most planes, pilots find it difficult to see directly behind the plane. The wings and fuselage also serve as natural shields against the pilot's field of vision. Unless the pilot is constantly weaving to check the sky in all directions, you may not be seen until your attack is underway.

Taking the First Shot

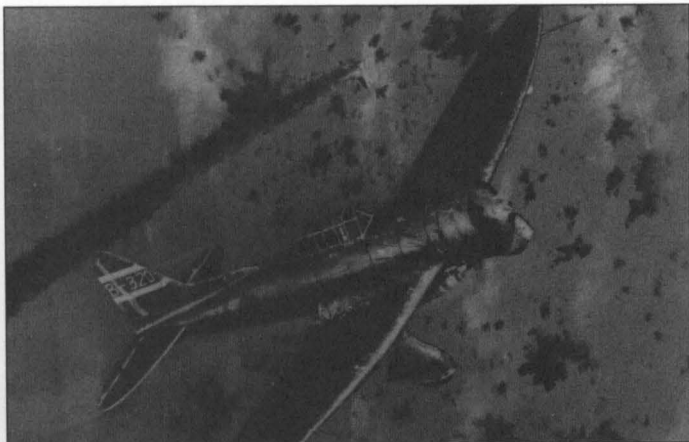
The greatest mistake many fighter pilots make is firing prematurely while out of range and wasting precious ammunition. Before shooting, make sure that your target is within the range of your weapon. Follow the general rule of thumb prescribed by seasoned dogfighters — hold your fire until the plane fills your gunsight.

Once you stalk your opponent and move within range, you are ready to attack. Unless you attack head-on or directly from the rear, your enemy will never remain in your gunsight for more than a few seconds. To increase your chances of an accurate hit, you should exercise *deflection shooting*. Deflection shooting means firing leading shots just ahead of your opponent's current position. With practice, the enemy plane will fly directly into the path of your bullets.

When firing leading bullets, you must take into account the speed of your target, the angle of attack, and the distance of your target. You must allow for more lead if the enemy is flying faster, flying perpendicular to you, or breaking away from you.

You will not always have to fire deflection shots. If you are tailing a plane or flying straight toward the enemy, you will make *zero deflection* shots. This means that you aim directly at your target without compensating for the forward movement of your plane or your enemy's plane. Zero deflection shots eliminate the need to shoot ahead of the target and do not affect your aim. You should be able to make zero deflection shots if you are making a head-on pass. (Note, however, that this undesirable position places you directly in the enemy's line of fire.) Also, if you are closing in behind an enemy aircraft at a slight angle, you should be able to make zero deflection shots for at least a few seconds.

Deflection shooting was first practiced in World War I by the great British ace Albert Ball and became standard practice for all fighter pilots after the 1920s. Many fighters, in fact, scratched "Christmas Tree" marks on the gunsight in order to compensate for target movement. Incrementing in length, the tick marks allowed fighters to aim their guns and cannon ahead of a target.



— ★ —
This diorama depicts a Val dive bomber trying to maneuver through heavy flak.
— ★ —

ATTACK PASSES

Once you initiate combat, you must outfight your enemy using a series of delicate maneuvers. If you are engaging a fighter plane, you will use different tactics than if you are attacking a bomber. Depending on what plane you are in and what plane your enemy is flying, you may choose different tactics in the same situation. For instance, P-40 and *Hellcat* pilots knew that their planes had superior diving abilities, so they utilized diving attack passes. The P-38, on the other hand, experienced structural problems during dives and split-S maneuvers, and had to rely on speed. Whatever type of plane you fly, you should become familiar with the following styles of attack.

Engaging a Fighter

Dogfight. This combat technique is a twisting series of actions and responses on the part of both pilots. Usually, one pilot tries to shake the tailing pilot and assume his firing position. The Japanese preferred this style of combat because their *Zeros* had a superior design and were more aerobatic. If you are flying a maneuverable plane capable of making quick turns, you are more likely to emerge the victor from a dogfight.

Dogfighting consumes a terrific amount of fuel, so you should make sure your plane is able to weather air-to-air combat. Paradoxically, most pilots chose to jettison their external fuel tanks upon engaging in a dogfight. This reduced the weight of the plane, rendering it more maneuverable. It also eliminated a prime target for enemy fighters.

Slash ("Hit and Run"). This combat technique stresses speed instead of maneuverability, using hit and run attacks that incorporate swift dives and powerful ascents. Slash attacks were the prime mode of attack for Allied planes, which were ill-suited for dogfighting against the aerobatic *Zeros*. In fact, fighters sent to intercept bomber squadrons in the Pacific often relied on this tactic to separate fighter escorts from the rest of the aircraft.

Slash attacks are most advantageous if you have the height advantage over your opponent. If you are flying a high-speed plane capable of making steep climbs (such as the F4F *Wildcat*), you will probably find this tactic useful.

Stern Attack. This tactic originated during World War I, when attacking pilots would sweep down onto the enemy's tail and open fire as they crossed the other plane's flight path. Easier to carry out than other attacks, the stern method was mostly used by inexperienced pilots or poor marksmen in fighter-fighter and fighter-bomber engagements.

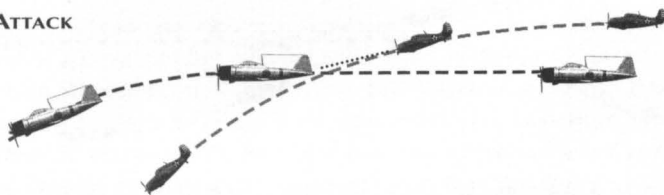
Stern attacks are most effective when you approach directly from the sun and less potent when you attack speedier aircraft (they can accelerate away from you during your dive). It is not recommended as an attack method against bombers because of the risk of being shot down by a tailgunner (see p. 89 for diagram).

Engaging a Bomber

You must adopt different tactics to engage a bomber because of the size and speed differences. The lumbering bomber is larger and less maneuverable than its sleek fighter counterpart and less able to evade your attack. Because of these disadvantages, most aircraft of this type were also heavily manned by gunners. When engaging a bomber, you should adhere to several main tactics.

Stern (Rear) Attack. As mentioned in the fighter section, the stern attack is a sweeping attack made from the rear. Requiring little skill, this tactic can be used with caution against bombers without rear gunners.

STERN ATTACK

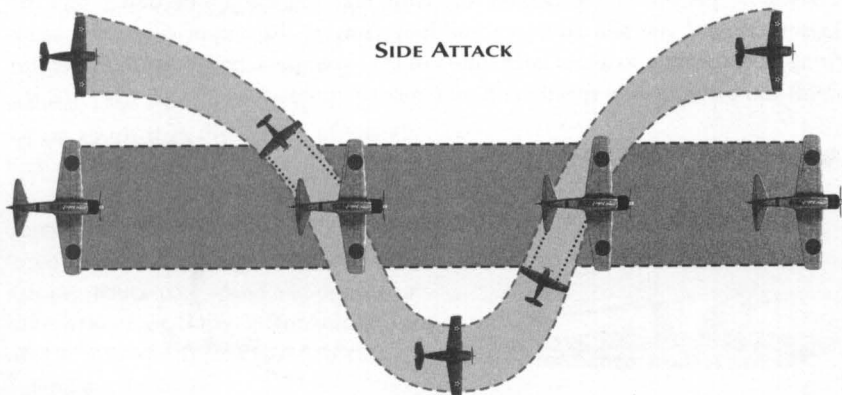


Side Attacks (High and Low). Side attacks allow you to move into position to make a deflection shot at your enemy. You can make a side attack either high or low, depending on your current position. The most effective attack, the high side pass, is a dive made from 1,500 feet above your enemy.

To make a high side pass, climb to the appropriate altitude. Then, push down on the control stick to begin diving. At the same time, bank in toward your enemy's plane at a 45-degree angle. Open fire when you are within range (remember to fire leading shots). Once you pass under the enemy plane, pull back on the joystick and use your diving speed to climb up. This will place you in position to repeat the attack from the opposite side.

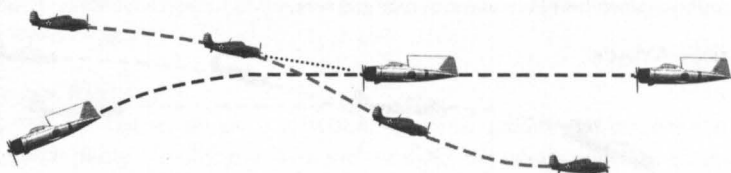
If you have a minimal altitude advantage (400-600 feet), you may opt for the low side pass. You execute this attack the same way you would a high pass, except that you do not need to dive steeply. Attacking low does not allow you to easily reposition yourself for a second attack.

SIDE ATTACK



Opposite Attack (High, Level or Low). This attack method involves facing the enemy from above, below or head-on for a one-time firing spree. Although this tactic does not require deflection shots, it is difficult to turn around for a second approach. To make a high opposite attack, fly toward the enemy plane at a slightly higher altitude. As you move closer, push the joystick away from you to descend. When you spot the enemy in your gunsight, begin shooting. Be sure to continue your downward flight path so that you do not hit your target.

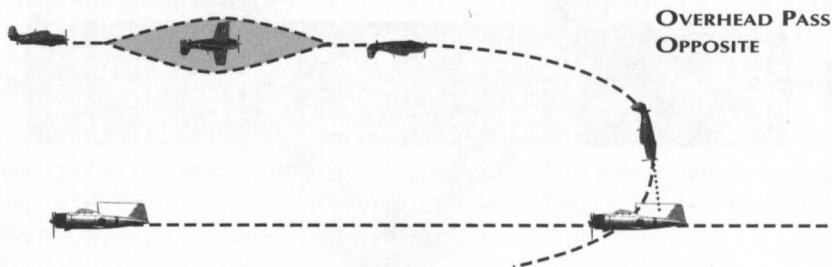
HIGH OPPOSITE ATTACK

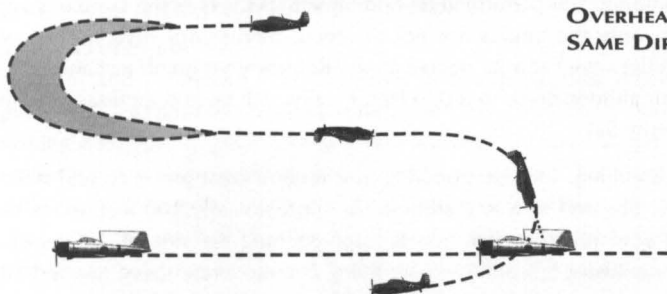


You can make a low opposite attack using the same method — the only difference is that you are climbing instead of diving. The last approach, level opposite attacks, involve flying directly toward your enemy. This method is the most dangerous because you fly directly into your opponent's spray of bullets. With practice, you will be able to jink slightly while firing, and in doing so, reduce your enemy's chances of hitting you.

Overhead Pass. This complex move is equivalent to performing back-to-back split-S and half-loop maneuvers. Many World War II pilots crashed trying to make an overhead pass, but it is a potent weapon if used successfully. You can approach your enemy from the same direction or from the opposite direction of his flight path. You must have several thousand feet of clearance both above and below your target to execute an overhead pass.

To make an overhead pass in the opposite direction, position yourself above, ahead, and to the right (or left) of your opponent. Then, go into a banking descent toward the enemy. Once you turn around 180 degrees and position yourself above the enemy, perform a 180-degree roll. Now that you are upside down, pull the joystick toward you and go into a half loop. Toward the end of your loop, begin firing at the enemy. To avoid tailgunner fire after your pass, bank hard to the left (or right) and use your dive speed to set up a second approach.





OVERHEAD PASS
SAME DIRECTION

To make an overhead pass from the same direction, line up vertically with your enemy, but at a slightly higher altitude. Perform a 180-degree roll so that you are looking down at your opponent. Before you reach the other plane, pull the joystick toward you and go into a half loop. Toward the end of your loop, begin firing at the enemy. To avoid tailgunner fire after your pass, bank hard to the left or right and use your dive speed to set up another approach from the same direction.

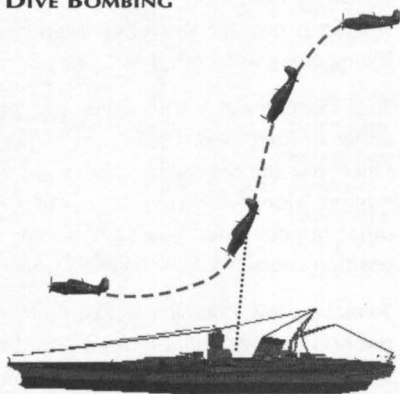
Attacking Ships and Ground Targets

One of your most essential objectives in naval warfare is to destroy enemy vessels and ground targets. If you succeed in sinking a carrier or destroying an airfield, you are grounding an entire squadron of aircraft. You can use four methods to attack ships — dive bombing, glide bombing, torpedo bombing and strafing. All of the same attacks apply to hitting ground targets, with the exception of torpedo bombing.

Dive Bombing. During a dive-bombing run, you approach the stern of the ship at an altitude of 10,000 feet. The higher your altitude, the longer you can train your bomb on the vessel. When you have almost reached the target (horizontally speaking), push forward on the joystick to go into a steep dive. Immediately apply your dive brakes or flaps to slow your descent. When you are approximately 2,000 feet above the ship, aim the bomb just slightly ahead of the target and release it. Finally, pull up and increase your throttle to fly away from enemy flak.

NOTE: Bombers usually have enough drag to avoid compressibility problems. However, none of the American fighter planes (except for the *Wildcat*) can withstand the effects of high-speed dives, which result in a disruption of the air flow over the wings. When this happens, the ailerons, flaps and elevators may not be effective and the plane will be hard to control. To compensate for this hindrance, reduce your speed and open your dive brakes or flaps. After you slow down, you should be able to regain control of your plane.

DIVE BOMBING



Glide Bombing. You perform glide-bombing maneuvers in the same manner as dive bombing, only the angles are not as steep. Begin your dive further away and approach the vessel at a 20-degree angle. Release your bomb just ahead of the ship when your altitude drops to 2,000 feet. Finally, pull up and increase your throttle to avoid enemy flak.

Torpedo Bombing. Torpedo-bombing runs require great precision and skill. To drop a torpedo, descend to a low altitude. At approximately 100 feet above the water, level out your plane so that you are approaching the side of the vessel. Reduce your throttle (using ☐) until you are flying at a moderate speed (around 100 mph). When you are within range, aim the torpedo slightly ahead of the ship. Then, release it and pull up the nose of your plane. Torpedo runs are most effective when executed simultaneously by two aircraft — this ensures that the ship cannot turn away from at least one of the torpedoes.

— ★ —

*Shrouded by
enemy fire,
three torpedo
bombers
stay low
during their
torpedo runs.*

— ★ —



Strafing. Strafing refers to firing a volley of bullets on a vessel or ground target. You can strafe from a dive or from a low approach, depending on your position. Dive strafing is best for striking a target along its length, while low strafing is best for hitting along its length *and* width.

To perform this attack from a dive, climb to above 10,000 feet and position yourself either in front of or behind the target. Push your joystick down to begin diving. Once you see the target in your gunsight, begin firing and pull up. Your forward motion, along with your dive, will spray bullets along the length of the ship (or other target). After you complete a strafing dive, you can pull up and turn to position yourself for a second round.

To make a low strafing attack, drop to a very low altitude (several hundred feet) and position yourself either in front of or behind the target. Increase your throttle speed and begin firing when the enemy is in range. To spread your ammunition into an arc, alternately turn the rudder left (☐) and right (☐) while firing.

DEFENDING YOUR PLANE

Wingman Defense

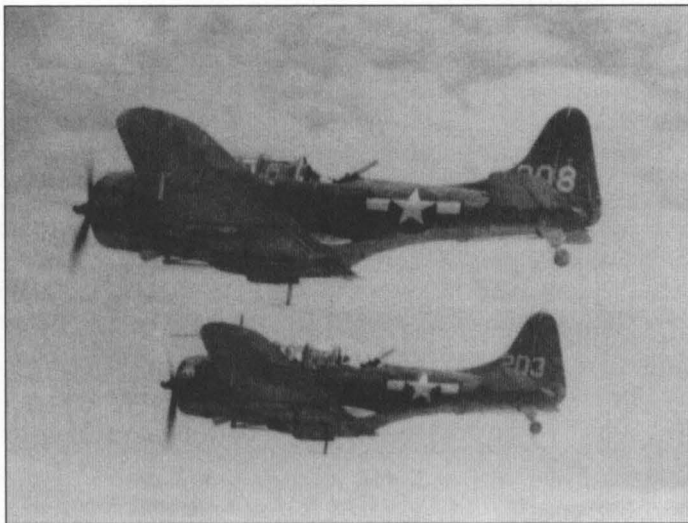
Both Japanese and American fliers traveled in groups during World War II, although the U.S. adopted the two-plane formation first. U.S. Navy pilots flew in pairs, forming a two-plane group called a *section*. One aircraft was designated as the *wingleader* and gave the other plane (the wingman) orders. The wingleader was responsible for scanning the skies straight ahead and directing attacks against targets. The wingman, on the other hand, followed orders and kept a sharp lookout to the rear. Together, they composed a mutual defense. Two sections formed a *division*, and several divisions composed a *squadron*.

The Japanese equivalent to the U.S. Navy section was a three-plane ensemble called a *Shotai*. Later, Imperial pilots adopted a four-plane formation that essentially consisted of two wingleaders and two wingmen.

Tailguns

Some World War II bomber aircraft carried two crewmen — a pilot and a tailgunner. The tailgunner was responsible for protecting the rear of the plane and was usually equipped with two .30-caliber or .50-caliber machine guns mounted on a pivot. Using these guns, the tailgunner could deter fighters from attacking the rear of the plane.

Bombers, such as the *Dauntless*, *Helldiver* and *Devastator*, had either a long canopy or a second sliding canopy for the tailgunner. Other planes (the Japanese *Betty* and the Grumman TBF/TBM *Avenger*) allowed tailgunners to fire from a ball turret (a rounded canopy protruding from the body of the plane). In the game, you use **[F7]** to switch to your tailguns. Then, you aim and fire just as you would with your front guns. To fly the plane while in this mode, press Button 2 on the joystick.



— ★ —
Tailgunners in these SBD Dauntlesses scan the sky as they man their positions. Dauntlesses were equipped with two .30-caliber rear guns.

— ★ —

- Ace.** Pilot having five confirmed aerial kills.
- Ailerons.** Control surface on each wing that rolls the plane.
- Altimeter.** Cockpit instrument that shows the plane's height relative to sea level.
- Altitude.** Height at which the plane is flying above sea level.
- Angle of Deflection.** Angle of a target's geometric plane relative to the attacking aircraft's.
- Arresting Hook.** Retractable metal hook descending from the bottom of carrier-based planes. The hook catches on a wire on the deck and stops the plane.
- Arresting Wire.** Wire on carrier decks that catches arresting hooks on carrier planes.
- Bandit.** Any identified hostile aircraft.
- Bank.** To turn the plane by dipping one wing and pitching upward. Ailerons and elevators control bank turns.
- Barrel Roll.** To roll the plane about the longitudinal axis in a screw-like motion.
- Bogey.** Any unidentified aircraft.
- Bow.** Forward section of a ship.
- Break.** To turn quickly and sharply. Also, to tell another pilot that he needs to take evasive action against a tailing enemy.
- Chandelle.** Wide 180-degree turn made by banking and increasing the pitch of the plane. This results in gaining altitude and reversing direction.
- Checking Your Six.** Looking behind you in the six o'clock position for enemy aircraft.
- Compression.** Physical disruption of air flow over a plane's control surfaces that occurs as the plane approaches the speed of sound. Sonic shock waves break up airflow, placing great stress on the airframe and rendering the ailerons and elevators inoperable.
- Decoration.** Medal or award given to individuals for courageous acts.
- Deflection Shot.** Firing "leading" shots ahead of a target to compensate for movement between the time the shots are fired and the time the bullets cross the path of the target.
- Dive Bombing.** Steeply nosing the plane down toward a target and releasing a bomb.
- Dive Brakes.** Air brakes on dive bombers that slow down the plane during steep dives.
- Division.** American four-plane fighting unit consisting of two sections (each having a section leader and wingman).
- Dogfight.** Fast-paced aerial combat in which fighters twist and turn as they try to evade and shoot one another.
- Drag.** Resistance between the airflow and the airplane's surfaces (also called wind resistance).
- Elevators.** Control surfaces on the tail of the plane that control pitch.
- Flak.** Anti-aircraft fire from the ground or from ships.
- Flap.** Control surface on a wing that gives the plane lift.
- Fleet.** Group of warships.
- Fuselage.** Body of the plane, not including the wings, tail or engines.
- G-Force.** Unit measurement of force equal to the force exerted by Earth's gravity on objects.
- Gravity.** Constant force that pulls objects toward the Earth. It is always applied in the same direction with virtually the same force.
- Immelmann.** Turn that reverses the plane's direction and increases altitude.
- Jink.** To perform a series of sharp bank turns, alternating left and right.
- Kamikaze.** Pilot who performs a suicide bombing mission (also, the mission itself).
- Kill.** Any plane shot down and credited to a pilot.
- L.S.O.** Landing Signal Officer that signals/guides carrier planes during landings.
- Lift.** Force created under the wings as air passes at different speeds across the top and bottom surfaces of the wings. This difference in air pressure results in a lifting force that "pushes" under the wings and lifts the plane into the air.
- Loop.** A vertical, 360-degree turn.
- Negative Gs.** G-forces that make you feel lighter and are incurred during steep dives.

- Opposite Attack.** Attack that involves facing the enemy from above, below or head on for a one-time burst of fire.
- Overhead Pass.** Attack made by positioning your plane above and slightly in front of your enemy, inverting and making a dive attack. This move may be made from the same direction or from the opposite direction.
- Pitch.** Rotation about an axis running through your plane from wingtip to wingtip. If you tilt the nose of the plane up or down, you change its pitch.
- Positive Gs.** G-forces that make you feel heavier (incurred in sharp turns or steep climbs).
- Roll.** Rotation about an axis running through the plane's nose and tail. During rolls, the plane's wings move up and down, but the aircraft flies a fairly straight course.
- Scissor.** Series of banks alternating to the left and then to the right (also called *jinking*).
- Scuttle.** To purposefully sink an unsalvageable, friendly ship by using torpedoes or guns or by opening the valves and flooding the vessel.
- Scratch.** Slang radio term relaying the destruction of a target, as in "Scratch that Zero!"
- Section.** Two-plane fighter unit consisting of a section leader and a wingman.
- Side Attack.** Attack made by diving and banking toward an enemy plane, firing, and using dive speed to climb and repeat the attack on the opposite side. It is called a side attack because it is made first from one side, then the other. Side attacks can also be made by climbing under an enemy plane at an angle.
- Slash Attack.** "Hit-and-run" attacks that incorporate swift dives and powerful ascents.
- Split-S.** Maneuver consisting of a half-roll followed by an inverted half loop. It is used to lose altitude and reverse direction while pulling positive G-forces. This maneuver is the opposite of an Immelmann.
- Squadron.** Group of fighter-plane divisions. (Each division is composed of two sections. A section has two fliers — a section leader and a wingman.)
- Stall.** Loss of lift caused by the breakup of the airflow into vortices (whirling patterns) over the plane's wings. This condition occurs in maneuvers made at slow airspeeds, such as tight turns, loops, climbs, takeoffs and landings.
- Stall Speed.** Minimum speed a plane can maintain without experiencing stall conditions.
- Stern.** Rear section of a ship.
- Strafe.** To fire a long burst of bullets at a ground target. The movement of the attacking plane causes the bullets to rake across the target.
- Thach Weave.** Defensive maneuver in which two planes perform a series of scissor turns toward one another. The attacked plane turns in, bringing the enemy plane into the other plane's line of fire.
- Throttle.** Device that controls engine speed. Also, the act of changing engine speed.
- Thrust.** Forward force applied to a plane by the propellers.
- Trap.** Act of catching an arresting wire with an arresting hook during carrier landings.
- V.B.** Abbreviation used by the U.S. Navy for dive bomber squadrons.
- V.F.** Abbreviation used by the U.S. Navy for fighter plane squadrons.
- V.S.** Abbreviation used by the U.S. Navy for scout bomber squadrons.
- V.T.** Abbreviation used by the U.S. Navy for torpedo bomber squadrons.
- Vertical Speed Indicator.** Cockpit instrument that indicates the plane's rate of ascent.
- Wingman.** Pilot that accompanies and takes orders from the section leader.
- Wing Over.** A 180-degree turn made by climbing and making a rudder turn when the plane nears stall speed.
- Yaw.** Rotation to the left or right that changes the heading of the plane without changing its vertical orientation. Also, the act of turning by using the rudder.
- Zero Deflection Shot.** Shot fired directly at a target without the use of deflection shooting. This type of shot is used when the enemy is moving directly toward or away from you, and you do not have to fire leading shots.

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